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FINAL
ENVIRONMENTAL IMPACT STATEMENT

on
Public Service Company of New Mexico's
Proposed
New Mexico Generating Station
and
Other Possible End Uses of the
Ute Mountain Land Exchange

United States
Department
of the Interior

Bureau of Land Management
New Mexico State Office
Santa Fe, New Mexico

November 1983

BLM NM-83-005-5000

NOTICE

This Final Environmental Impact Statement (EIS) is one of a series of environmental and related documents coordinated by the Bureau of Land Management (BLM). The BLM is considering the potential social, economic, and environmental effects of six separate but interrelated proposals within the San Juan Basin area of northwestern New Mexico. These proposals are:

- New Mexico Generating Station
- San Juan River Regional Coal Leasing
- Bisti, De-na-zin, and Ah-shi-sle-pah Wilderness Study Areas
- Coal Preference Right Leasing
- Ute Mountain Land Exchange
- Bisti Coal Lease Exchange

This Final EIS includes changes to the Draft EIS resulting from public review, as well as a record of public comments and the responses to those comments.

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United States Department of the Interior

BUREAU OF LAND MANAGEMENT
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SANTA FE, NEW MEXICO 87501

IN REPLY REFER TO
NM 30840 EIS
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November 1983

Dear Interested Citizen:

Enclosed is the Final Environmental Impact Statement (EIS) for Public Service Company of New Mexico's Proposed New Mexico Generating Station and Other Possible End Uses of the Ute Mountain Land Exchange (NMGS). This document was prepared by the BLM New Mexico, with assistance from many formal and informal cooperating agencies (see chapters 1 and 4).

The public comment period on the Draft EIS began November 30, 1982 and comments were accepted until close of business, April 8, 1983. During this period, approximately 1,170 comments were made on this EIS by 537 commenters. The primary concerns of the majority of commenters were in the areas of hydrology, air quality, purpose and need, alternatives and social and economic conditions. These comments and BLM's responses to them are included in chapter 4.

The Final EIS contains revised information on PNM's load forecast, water alternatives, the delay-of-action alternative, threatened or endangered species, and other possible end uses of the Ute Mountain Land Exchange including a water wellfield and gathering system. The Final San Juan Basin Cumulative Overview and Comment Letters are contained in a separate volume which has been previously distributed.

Sincerely yours,

Charles W. Luscher

Charles W. Luscher
State Director

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U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

FINAL
ENVIRONMENTAL IMPACT STATEMENT

Public Service Company of New Mexico's Proposed New Mexico Generating Station and Other Possible End Uses of the Ute Mountain Land Exchange

ABSTRACT

The applicant, Public Service Company of New Mexico (PNM), proposes to construct a 2000-megawatt (MW) coal-fired steam electric generating station in San Juan County, New Mexico. On June 2, 1977, PNM filed applications with the Bureau of Land Management (BLM), New Mexico State Office, for the rights-of-way grants for a water supply system and for 500-kilovolt (kV) transmission lines that would connect to the proposed Rio Puerco Station near Albuquerque. The proposed NMGS, at ultimate development, would have four 500-MW generating units. Fuel for the plant would be obtained from surface coal mines, currently under lease, to be developed near the plant site. The power generated by the plant would be transmitted on a 500-kV loop connecting to the approved Four Corners-Ambrosia-Pajarito (FC-A-P) line and on two 500-kV transmission lines to a new substation to be constructed near Albuquerque, New Mexico; from there, it would be distributed throughout the PNM service area. Water to operate the plant would be delivered by two pipelines from the San Juan River. These linear features involve the following counties: San Juan, McKinley, Cibola, and Sandoval. Two alternative pipeline and transmission line routes were analyzed along with other alternatives. Possible end uses of the proposed Ute Mountain Land Exchange were assessed, including a possible new town and water wellfield and gathering system. The No-Action and Delay-of-Action Alternatives were also analyzed.

Type of Action: (X) Administrative ( ) Legislative

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Charles W. Luscher

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State Director, New Mexico

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Summary

SUMMARY

NEW MEXICO GENERATING STATION

PNM proposes to construct a 2000-megawatt (MW) coal-fired steam electric generating station on the Bisti lands in San Juan County, New Mexico. On June 2, 1977, PNM filed applications with the Bureau of Land Management (BLM), New Mexico State Office (NMSO), for rights-of-way (ROW) grants for a water supply system (application No. NM 30840) and for 500-kilovolt (kV) transmission lines (application No. NM 30841) that would connect to the proposed Rio Puerco Station near Albuquerque. In 1981 PNM filed application for another 500-kV line to extend from the proposed generating station to serve utilities in California, and perhaps Arizona. In July 1981, PNM withdrew its application for the out-of-state transmission line.

In response to PNM's applications, the BLM NMSO was designated Lead Agency for the preparation of this EIS, in accordance with the provisions of the National Environmental Policy Act (NEPA), the regulations of the Council on Environmental Quality (CEQ, 40 CFR 1500 through 1508), and BLM guidance. The BLM New Mexico State Director has the authority to issue all land use grants, permits, and amendments for public lands in New Mexico. Such grants and permits would be contingent on the applicant's receipt of all other necessary permits.

PURPOSE AND NEED

According to the statement of purpose submitted to BLM by the applicant, PNM, the major purpose of the proposed NMGS is the generation of electricity using San Juan Basin coal to meet the forecasted need of PNM's system. The use of coal is desirable because it is available in New Mexico and can be permitted in PNM's planning time frame.

The ultimate authority for resolving the question of need rests with the New Mexico Public Service Commission when it considers PNM's application for a Certificate of Public Convenience and Necessity.

PROPOSED ACTION

PNM has filed applications with BLM for ROWs on public land for a water supply system and two 500-kV transmission lines that would be needed in the development of the proposed 2000-MW NMGS coal-fired steam electric generating plant. The proposed NMGS, at ultimate development, would have four 500-MW generating units. Fuel for the plant would be obtained from surface coal mines currently under lease or pending PRLAs, to be developed near the plant site. The power generated by the plant would be transmitted on a short 500-kV loop connecting to the approved Four Corners-Ambrosia-Pajarito (FC-A-P) line and on two 500-kV transmission lines to a new substation to be constructed near Albuquerque, New Mexico; from there, it would be distributed throughout the PNM service area. Water to operate the plant would be delivered by two pipelines from the San Juan River. The first generating unit could be required for commercial operation in 1990; other units could be available for operation in 1993, 1995, and 1998 respectively. The 500-kV loop connecting with FC-A-P would be in service in 1990; the first transmission line to the Albuquerque area would be in service in 1993; the second, in 1998.

ALTERNATIVES

In addition to the Proposed Action, several alternatives were identified. The alternatives considered in this analysis can be grouped into two categories: alternative project components and alternatives to the

entire NMGS project. Project component alternatives are summarized in Table S-1. Alternatives to the entire NMGS project include the no-action alternative and the delay-of-action alternative. The no-action alternative is defined as the NMGS project not being constructed. Consequences of the no-action alternative include several options (Table S-2) that PNM could consider to meet its forecasted need if the no-action alternative were selected. The delay-of-action alternative is defined as a delay of one or more years.

SCOPING

Sixteen scoping meetings were held in 1981 to identify the major issues, alternatives, and concerns of the NMGS EIS. These activities included meetings specifically oriented to one of the following groups: federal agencies, state agencies, local agencies, Native Americans, and the general public. In addition, four public meetings were held in 1982 to update the public on the status of the EIS process and to present for comment the alternatives to be addressed in detail in the EIS. The issues identified as major were air quality, water quality and supply, social and economic concerns (with focus on rural Navajos), cultural resource concerns, and need for the project.

SUMMARY OF ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION AND ALTERNATIVES

Alternatives, the applicant's Proposed Action, and the no-action and delay-of-action alternatives were evaluated to determine their potential impacts. Impacts summarized here (detailed in Chapter 3 and compared in Chapter 1) include those identified as significant and others that are considered important by the public or which provide meaningful information for the comparison of alternatives.

Air Quality

Emissions from the proposed NMGS were analyzed using computer dispersion models to project maximum 24-hour and annual ambient concentration increases of pollutants (total suspended particulates, sulfur dioxide, nitrogen oxides, and carbon monoxide). Projected concentration increases, when combined with other existing point and area sources of air pollution, would result in total concentrations that would be less than New Mexico and federal ambient air quality standards.

No quantitative techniques are currently available with which to project acid precipitation formation and the effects due to a particular source. If increases occur in acid precipitation as the result of NMGS emissions, the alkaline nature of soil in the San Juan Basin and the presence of soil in local waterways would serve as a buffer and minimize impacts to living resources in the San Juan Basin. However, there is potential for impacts associated with acid precipitation in those areas outside the San Juan Basin that are poorly buffered, and thus susceptible to reductions in pH. From information in the available literature, it was determined that areas that would be most susceptible to acid precipitation include lakes, headwater streams, and poorly buffered soils in high mountain areas of northern New Mexico and Colorado. Assuming that acid precipitation would occur and would be related to SO_2 and NO_x levels, NMGS could pro- duce impacts by contributing to cumulative emissions in the region. Considering total emissions projected for a three-state area (New Mexico, Utah, and Colorado), NMGS would contribute approximately 3 percent of the energy-related total emissions which may be related to the formation of acid precipitation.

Visibility analyses indicate that the plume from the proposed NMGS would be slightly visible from the San Pedro Parks Wilderness Area and Mesa Verde National Park. Because of the distance of those sites from the proposed NMGS (75 miles), neither plume perceptibility nor visibility impairment from the plume would be frequent or signficant. Viewed from Chaco Culture National Historical Park, perceptible plume discoloration is predicted to occur approximately 36-37 mornings and 5-6 afternoons per year, with maximum occurrence during winter. Highly perceptible plume discoloration is predicted to occur about 1-2 mornings per year. NMGS could contribute to regional haze.

Table S-1. SUMMARY OF ALL PROJECT COMPONENT ALTERNATIVES CONSIDERED AND THOSE SELECTED FOR ANALYSIS

	Proposed Action	Alternatives Considered	Alternatives Selected for Analysis
NMGS	Four 500-MW coal-fired units completed 1990-2000	No action (other means of providing for need) Delay of action	No action Delay of action
Project Component			
Site	Bisti	McKinley County Torrance County	McKinley County Torrance County
Fuel Supply System			
Coal supply	Sunbelt and Arch Minerals joint venture	Other San Juan Basin coal producers Coal sources outside San Juan Basin	Other San Juan Basin coal producers
Coal handling	Trucked to NMGS site, conveyor belt to active and emergency storage piles on-site	Coal transported by conveyor belt to site and then to power plant Off-site storage of run-of-mine coal	Coal transported by conveyor belt and then to power plant Off-site storage of run-of-mine coal
Pollution Control Systems			
Particulate removal	Fabric filter	Electrostatic precipitator	Electrostatic precipitator
SO_2 control	One of the following: • Wet limestone scrubbing • Alkali spray-drying	Wet limestone scrubbing, lime spray-drying, dry types, regenerable types	None
NO_x control	One of the following: • Dual-register burner • Tangentially fired steam generation • Controlled-flow/ split-flame burner	Low NO_x boiler design, flue gas recirculation	None

Table S-1. SUMMARY OF ALL PROJECT COMPONENT ALTERNATIVES CONSIDERED AND THOSE SELECTED FOR ANALYSIS (continued)

Project Component	Proposed Action	Alternatives Considered	Alternatives Selected for Analysis
Solid waste disposal	Return to coal mine for layered disposal	Marketing of fly ash for commercial products	None
		Random dumping in mined-out pits	
		Off-site landfill	
		On-site landfill	
Heat Rejection System	Wet-type cooling towers	Wet-dry cooling towers	Wet-dry cooling towers
		Once-through cooling	
		Cooling ponds	
		Natural-draft cooling towers	
		Dry mechanical-draft cooling towers	
Water Supply System			
Water supply sources	35,000 acre-feet/year (ac-ft/yr) from San Juan River	20,000 ac-ft/yr from San Juan River and 15,000 ac-ft/yr from wellfield	20,000 ac-ft/yr from San Juan River and 15,000 ac-ft/yr from wellfield
		20,000 ac-ft/yr from San Juan River (if wet/dry-cooling towers)	20,000 ac-ft/yr from San Juan River (wet/dry-cooling towers)
		35,000 ac-ft/yr from well-field	
		35,000 ac-ft/yr from uranium mine dewatering	
		20,000 ac-ft/yr from San Juan River and 15,000 ac-ft/yr from uranium mine dewatering	
		McElmo Creek Unit (Colorado River Water Quality Improvement Program)	

Table S-1. SUMMARY OF ALL PROJECT COMPONENT ALTERNATIVES CONSIDERED AND THOSE SELECTED FOR ANALYSIS (concluded)

Project Component	Proposed Action	Alternatives Considered	Alternatives Selected for Analysis
Surface-water diversion (intake)	Near Farmington	Near Bloomfield	Near Bloomfield
Water supply pipeline	Alignment paralleling NM Highway 371 (P1), originating at Farmington	P2 alignment paralleling existing pipeline ROW (El Paso Natural Gas), originating near Bloomfield P3 also originating near Bloomfield	P2, P3
Reservoir	2 miles south of NMGS site, T23N, R13W, Section 36 (R1)	R2 approximately 3 miles southeast of proposed NMGS site	R2
Transmission System			
Transmission lines	T5, T2, T1	T3, T4	T3, T4
Station	Rio Puerco	None	None

Table S-2. NO-ACTION ALTERNATIVES

Coal conversion plant	A coal gasification facility in conjunction with either a combined-cycle or fuel-cell generating plant. This would probably not be commercially available until the mid-1990s.
Decentralized coal-fired steam electric system	Two or more small coal-fired plants with the same combined capacity as NMGS, built at two or more locations.
Geothermal plant	A generating plant using steam from underground high-temperature (>150°C) hot water reservoirs.
Nuclear plant	A light-water fission reactor plant. Operation of such a plant could probably not commence until the mid-1990s.
Out-of-state power source	This alternative would rely on either contract purchase of out-of-state power or equity participation in one or more out-of-state generation projects.
Renewable resource alternatives	This is a combination strategy involving a variety of renewable generation resources, possibly including hydroelectric, central-station solar-thermal electric and photovoltaic, decentralized photovoltaic, central-station wind, agricultural and forestry wastes, and municipal solid waste. Energy storage wood generation and/or geothermal power might be required with this alternative.
Other sites	Other sites potentially capable of supporting a 2000-MW coal-fired steam electric generating station may have to be considered.
Alternatives uses of San Juan Basin coal	The coal may either be used locally within the basin for another proposed facility, such as a coal gasification plant, or exported for use outside the basin.

Noise

Based on noise monitoring at the existing San Juan and Four Corners power plants, no significant impacts resulting from construction and operation of the proposed NMGS would be expected beyond 0.5 mile and no detectable impacts would be expected beyond 2 miles. No significant impacts would be expected at the Bisti and De-na-zin Wilderness Study Areas (WSAs), since they are located 2.1 and 3.5 miles from the proposed NMGS.

Geology

No impacts to unique geologic features or locations of unusual scientific value were identified. Potential geologic hazards to some project components were identified that should be considered during design and construction phases of the proposed project.

Mineral Resources

Operation of NMGS would result in consumptive use of 300 million tons of coal and 4 million tons of limestone over the projected 40-year project life. The consumption of 300 million tons of coal would be considered a significant impact on a local and regional level because more than 1 percent of the estimated strippable coal reserves in the Bisti areas (local) and within a 30-mile radius of the NMGS plant site (regional) would be unavailable for future beneficial use. From a national perspective, this coal consumption would not constitute a significant impact and is consistent with national energy policy and goals.

Paleontological Resources

Several of the proposed and alternative NMGS project components would occupy areas that are in highly sensitive paleontological zones. Highly sensitive zones for the Proposed Action include the entire plant site, 2 linear miles of water pipeline P1, 50 linear miles of transmission line T1, and 3 linear miles of transmission line T5. Highly sensitive zones for alternative project components include 2 linear miles of water pipeline P2, 13 linear miles of water pipeline P3, and 3 linear miles of transmission line T4.

Areas of significant paleontological resources for which no resource recovery program is stipulated or implemented would be adversely affected, either directly by the destruction, damage, or alteration of bedrock formations, or indirectly by increased recreational fossil collecting or commercial collection of materials.

Soils

Soils would be affected and potentially significant impacts could occur as the result of construction activities associated with any of the proposed or alternative NMGS project components. Major concerns would be areas susceptible to wind or water erosion, areas with steep terrain, or areas difficult to reclaim once topsoil is removed. High erosion susceptibility exists over 100 percent of the proposed NMGS site, 84 percent of water pipeline P1, 74 percent of transmission line T1, 69 percent of transmission line T2, and 100 percent of transmission line T5. High erosion susceptibility on alternative project components includes 73 percent of water pipeline P2, 77 percent of water pipeline P3, 66 percent of transmission line T3, and 59 percent of transmission line T4. The significance of these impacts would be reduced by implementation of the applicant's erosion control measures specified in Chapter 1.

Water Resources (Hydrology and Water Quality)

Proposed Water Supply System. The average annual supply of water in the San Juan River in New Mexico would be depleted by 35,000 acre-feet per year (ac-ft/yr). Streamflow would be reduced by an average of 48 cubic feet per second (cfs) downstream of the intake structure. Reductions in streamflow would not be significant even during critical dry periods (low flow; defined as streamflow of 520 cfs at Farmington). No significant impacts to water quality were identified.

Alternative Water Supply System. The average annual supply of water in the San Juan River in New Mexico would be depleted by 20,000 ac-ft/yr. Streamflow would be reduced by an average of 28 cfs. Reductions in streamflow would not be significant during critical dry periods (low flow). No significant impacts to water quality were identified.

Consumptive use of 15,000 ac-ft/yr of ground water from a wellfield near the proposed NMGS would result in significant

drawdowns to the Westwater Canyon Member, Dakota Sandstone, and the Entrada Sandstone aquifers in the San Juan Structural Basin. Maximum drawdowns (approximately 3000 feet) in the Westwater Canyon Member would occur in the vicinity of the wellfield in the year 2033. Significant land subsidence (greater than 1 foot) would probably not result from the withdrawal of ground water.

Pumping of the wellfield could cause a reduction in the flow of springs in the Chuska Mountains. Available information is not sufficient to quantify whether the reduction in flow would be significant (i.e., greater than 15 percent of average daily flow). However, this information is not necessary to make a reasoned choice among alternatives. Pumping from the wellfield would also decrease the natural ground-water discharge into the San Juan River, Rio San Jose, Rio Puerco, and Puerco River by up to 0.09 cfs. This impact would not be significant.

Vegetation

Approximately 2400 acres of vegetation would be removed at the proposed NMGS site for the life of the project. This would not be a significant impact because the vegetation types removed are common in the region. Vegetation on water pipeline corridors or transmission line corridors would be temporarily disturbed during construction activities but should become reestablished with the aid of successful reclamation. No impacts to unique regional vegetation were identified (i.e., removal of more than 1 percent of a unique type, such as riparian vegetation). High elevation ecosystems are susceptible to potential acid precipitation.

Wildlife

The most direct construction impact on wildlife would be the clearing of wildlife habitat from the proposed NMGS site and proposed or alternative ROWs. This is not considered a significant impact on the plant site because no crucial wildlife habitat is present. Within proposed and alternative transmission line or water pipeline corridors, a limited amount of crucial wildlife habitat would be disturbed by construction activities. Linear miles of crucial mule deer winter range crossed by water pipelines include 2.8 miles, P1; 1 mile, P2; 1 mile, P3. Linear miles of mule deer and elk crucial winter range crossed include 12.0 miles for transmission line T4. The impacts would not be significant because less than 1 percent of the crucial regional winter range would be disturbed.

Other impacts on wildlife would include interruption of habitat continuum and impacts associated with human presence and activity. Human disturbance to big game on winter range could occur along water pipelines P1, P2, and P3 and transmission line T4. Human disturbance to nesting raptors could occur along any of the proposed or alternative transmission lines but none of the water pipelines. Greater hunting and fishing pressure would also occur as the result of increased human populations associated with construction and operation of NMGS. High elevation wildlife habitats in New Mexico and Colorado are susceptible to potential acid precipitation.

Threatened and Endangered Species

The construction of the proposed plant would not affect any federal or state threatened, endangered, or candidate species. Operation of the NMGS may affect one plant species, the Mancos milkvetch, and two animal species, the greenback cutthroat trout and bald eagle. These three species may be affected because of acid precipitation that could result from NMGS emissions. The Mancos milkvetch may be affected because soils that support this species are not well buffered and may be susceptible to decreases in pH. The greenback cutthroat trout may be affected because headwater streams in high mountain areas of Colorado that support this species are poorly buffered and are susceptible to decreases in pH that could result from acid precipitation. One active bald eagle nest site at 8400 feet elevation in southern Colorado could be affected by potential acid precipitation.

Proposed and alternative project components other than the proposed NMGS plant site may affect one additional threatened species, the Mesa Verde cactus. Potential habitat for this species is present in areas traversed by proposed and alternative transmission and pipeline corridors. A survey for the selected routes would be initiated to

determine if the species is present and would be affected. Potential impacts to this species would be minimized through compliance with regulations associated with its protected status.

Cultural Resources

The proposed construction and operation of the NMGS, water supply system, and transmission system would directly alter, damage, or destroy an unknown number of presently unidentified, as well as identified, archeological and historic sites or sites of importance to traditional Native American values. Significant indirect adverse impacts could also occur as a result of exposure and increased uncontrolled collection of archeological resources. In addition, indirect impacts could include increased collection of Native American materials and decreased opportunity for Native Americans to maintain a traditional lifestyle, which requires the maintenance of sacred sites. The extent and magnitude of impacts resulting from construction of any of the proposed or alternative NMGS project components cannot be determined until a site-specific inventory and evaluation is conducted for areas delineated by the State Historic Preservation Officer.

Visual Resources

Construction and operation of the proposed NMGS would result in contrast ratings that exceed BLM visual resource management (VRM) objectives; thus these impacts would be significant. Visual impacts would be most apparent from within the Bisti WSA, a 3-mile viewing distance from NMGS. Contrast ratings would also be exceeded and significant visual impacts would occur on each of the proposed and alternative transmission line study areas. Miles of ROWs that would exceed contrast ratings for BLM VRM Class II and Class IV areas include: 25 miles, T1; 10 miles, T2; 30 miles, T3; and 15 miles, T4. No contrast ratings would be exceeded along any of the proposed or alternative water pipelines. Construction of the T2 transmission line would result in visual impacts to Chaco Culture National Historical Park.

Recreation and Wilderness

Construction activities, noise, visual contrast, and dust would significantly detract from the quality of recreational experiences in the WSAs located near project compo- nents. Recreation experiences at the Bisti and De-na-zin WSAs would be particularly affected by activities at the proposed plant site. Increased visitor use (camping, pic- nicking) in areas including Navajo Lake State Park, Angel Peak, Chaco Culture National Historical Park, Bisti WSA, and De-na-zin WSA could result in significant increases in litter, vandalism of cultural resources, fire, and removal of paleontological material. These impacts could degrade the quality of recreational resources. Recreational use of off-road vehicles (ORVs) near WSA bound- aries could significantly affect the primitive and unconfined recreational experience in areas used for hiking and picnicking. ORV use may also result in increased damage to vegetation and soils throughout the project area. Recreational uses of high mountain areas of northern New Mexico and Colorado could potentially be affected by acid precipitation.

Transportation

The only transportation alternative that excludes truck transport of materials along New Mexico Highway (NM) 371 to the proposed NMGS site assumes completion of the Star Lake or Con Paso railroad spur project. If the Star Lake-Bisti railroad spur is not used, significant travel delays would occur during the construction phase along the southern stretches of NM 371 and U.S. 666-Navajo 5 from Interstate 40. Travel delays along NM 57 would be most significant during months when visitation is highest at Chaco Culture National Historical Park. Significant delays and safety problems would also occur on NM 371 with the addition of 650 vehicles during peak commute periods for peak operation employment years, particularly as commuter vehicles mix with haul trucks. Further impacts could occur on NM 44 if project personnel commute from Bloomfield via County Road 15. Significant increases over baseline traffic flows are also projected in Farmington and Bloomfield due to project employees residing in those areas. The estimated addition of vehicles to cross-town traffic in Farmington during peak commute periods of the day for peak employment years is 650 or a percentage increase of 10-20.

Social and Economic Conditions

Total NMGS project-related labor requirements would exceed 1600 jobs for construction and 900 for operation. Approximately $780 million would be added to the region in direct and indirect income. An increase in assessed valuation of affected taxing jurisdictions would make increased revenues available for the region's municipalities and the Farmington Municipal School District. Significant impacts to human services could occur; agencies are already near capacity, and future funding sources are uncertain. Potentially significant impacts could occur if projected housing demand exceeds the availability of units (peak demand due to NMGS construction work force would be 600 units in 1986-87). Impacts may include increases in housing costs and in the proportion of mobile homes. Other significant impacts could occur to human service delivery capacities and to certain traditional Navajos and future generations whose opportunities to practice traditional lifestyles would be diminished.

Delay of construction of Units 2, 3, and 4 by one year would have a beneficial impact, since employment needs on other major projects in northern San Juan County are expected to decrease in 1991, 1992, and 1993. If NMGS work force needs were higher in those years, worker in-migration would be less and local unemployment would be reduced.

If construction of units were delayed so that peak NMGS employment demand coincided with high labor demand from other projects in the region (e.g., 1987, 1989, 1996, 1997), social and economic impacts would be more adverse. Greater in-migration of new workers to the area would result in increased demand for community facilities and services. Housing, schools, human services, and traditional lifestyles in the affected region would be strained.

Delays between construction of NMGS units would generally have an adverse effect on social and economic conditions in the affected region. Unless they are assured of continued local employment opportunities, workers are likely to migrate out of the area as NMGS needs taper off with the completion of individual units. This would aggravate fluctuations in local population.

Land Use Controls and Constraints

There would be no conflicts with existing land use plans or controls.

Since the time of the filing of the Draft EIS in November 1982, revised information from the applicant or from public and agency comments has become available which has been incorporated into the EIS. Letters received from PNM are included as Appendix E additions. Also, public comment has resulted in corrections to the text. Where needed, impact assessments were revised or extended.

The following subject areas have been changed or added to in the EIS text in response to this revised information.

- The applicant has submitted its annual load growth forecast for 1982. These figures were reviewed as part of the assessment of Purpose and Need and are included. In response to these figures, the social and economic conditions analysis of the delay-of-action alternative has been extended and the alternatives to the project analysis were reassessed based on the possible use by the applicant of less than 2000 MW.

- The Bureau of Reclamation notified the BLM of their current review of an assignment of 20,000 acre-feet per year (ac-ft/yr) from an existing contract held by Utah International to be assigned to Paragon Resources, Inc. (a PNM subsidiary) for use in the NMGS proposed project. In response to this notification, the BLM reviewed the previous EIS analysis of water alternatives (Hydrology TR) and has added information to it for purposes of the Bureau of Reclamation decision process. A summary of the previous analysis and additions to it are contained in this section.

- A section called McElmo Creek Unit has been added to the EIS appendix (A) which describes alternatives identified and considered, but not in detail.

- Analysis of the alternative water intake structure locations (Farmington and Bloomfield) was extended to further evaluate flooding-related environmental consequences.

- Site-specific impacts of coal mining for coal sources for NMGS that are under existing lease or pending PRLAs have been addressed in the SJRRCL EIS. General impacts of coal mining have been summarized in Chapter 3.

- Based on a review of comments on the DEIS, the BLM recognized that the EIS had not made clear to the public the relationship between this EIS and the Ute Mountain Land Exchange (UMLE) proposal. In response to this the EIS has been clarified as follows:

  The title of the section has been changed from "Possible New Town" to "Other Possible End Uses of the Ute Mountain Land Exchange."

  The Introduction and Scope of this EIS section has been changed to clarify that alternatives to the UMLE as a means of PNM's obtaining the proposed NMGS site exist and are: BLM's sale, lease, or granting ROWs for use of the lands. Similarly, alternative means for BLM's acquiring the Ute Mountain land are: Paragon Resources, Inc.'s sale, lease, or donation of those lands to BLM.

  An assessment of a water wellfield and gathering system has been added to that section as a possible end use of the Bisti lands in conjunction with NMGS EIS water source Alternative 1 (20,000 ac-ft/yr from San Juan River, 15,000 ac-ft/yr ground water).

AGENCY'S PREFERRED ALTERNATIVES

This EIS involves two BLM actions: whether to approve the Ute Mountain Land Exchange and whether to issue ROW grants for transmission and pipelines associated with the NMGS.

Ute Mountain Land Exchange

The Ute Mountain Land Exchange (UMLE) was the subject of a EA (BLM 1981) in which Paragon Resources, Inc., proposes to exchange approximately 17,138 acres of private lands in Taos County, New Mexico (Ute Mountain) for approximately 8000 acres of public land in the San Juan Basin (Bisti lands). In a BLM planning decision (Rio Grande MFP), BLM decided it would "attempt to acquire Ute Mountain...for its unique natural values and the buffer area it provides for the Rio Grande Wild and Scenic River." The reason for wanting to acquire this land is to "...provide for better protection and management of the Wild and Scenic River."

The Ute Mountain Land Exchange EA addresses the environmental impacts of the proposed exchange and the NMGS EIS addresses alternatives to the exchange both for the Bisti lands and Ute Mountain, in addition to the proposed and possible end uses of the Bisti lands. These two documents provide NEPA coverage for the proposed exchange.

The BLM desires to acquire Ute Mountain for its recreational and other values; therefore, BLM's preferred alternative is to consummate the Ute Mountain Land Exchange. This action would also make available the lands PNM would receive in the exchange for use as a site for NMGS. Before consummating the exchange, the Department of Interior must resolve that part of the Navajo Tribe's selection under the Navajo-Hopi Relocation Admendments which are in conflict with the exchange.

ROWs for the New Mexico Generating Station

The BLM's second action pertains to PNM applications for water pipelines and transmission ROWs associated with the proposed NMGS. Based on the impact analysis (see EIS Chapter 3, Tables 1-7, 1-8, and 1-9), BLM has determined that the following route alternative would have the least amount of environmental impact:

- Water pipeline route P1, which includes the proposed intake structure near Farmington and water reservoir

site R1. The route for P1 is the shortest distance and would be located within an existing highway ROW for approximately 75 percent of its length.

- Transmission route T5 corridor for the 5-mile connecting loop to the approved FC-A-P line.

- T3 for the second 500-kV transmission line.

- T2 for the third 500-kV transmission line.

Of the four alternatives, T2 and T3 are the shortest in length and follow the greatest number of miles of existing ROWs. In addition, T2 and T3 would cross the least amount of recoverable coal. Rio Puerco Station would be the terminus point for both T2 and T3.

The BLM New Mexico State Director has the authority to issue all land use grants, permits, and amendments for public lands in New Mexico; however, in order to construct the NMGS, approximately 30 other federal and state permits or approvals would be required (see Appendix F). Based on the impact assessment, these ROWs would be an acceptable use of public lands. However, because of the major role of several state agencies in issuing the necessary permits and approvals for NMGS and because of the uncertainty in the precise timing of NMGS, the BLM's preferred alternative for the ROW grants is to issue these grants for the above-mentioned alternatives once other applicable permits have been obtained by the applicant.

AREAS OF CONTROVERSY

Areas of controversy have been raised by the public and agencies throughout the EIS process. Of the issues raised (see Chapter 4), environmental issues that were within the scope of this EIS are discussed in Chapter 3. Other areas of controversy include the following:

- Navajo-Hopi Relocation Act - selection of 35,000 acres of public land in northwestern New Mexico which includes the proposed site for NMGS.

- Navajo lawsuit - claiming 2 million acres of land in northwestern New Mexico which includes the proposed site for NMGS.

- Is there a need for power from NMGS?

- Cumulative impacts of the proposed San Juan Basin development to Chaco Culture National Historical Park, especially from transmission line corridors.

- Availability of a water source for 35,000 acre-feet per year.

- Proximity of the proposed NMGS site to the Bisti and De-na-zin WSAs and Chaco Culture National Historical Park.

- Jicarilla Tribe's lawsuit against the second Amendatory Contract between Utah International Inc. and the United States, involving use of the proposed and alternative water sources.

- Is there a need for development of a new town?

Introduction and Scope

INTRODUCTION

The applicant, Public Service Company of New Mexico (PNM), proposes to construct a 2000-megawatt (MW) coal-fired steam electric generating station in San Juan County, New Mexico. On June 2, 1977, PNM filed applications with the Bureau of Land Management (BLM), New Mexico State Office (NMSO), for ROW grants for a water supply system (application No. NM 30840) and for 500-kilovolt (kV) transmission lines (application No. NM 30841) that would connect to the proposed Rio Puerco Station near Albuquerque. In 1981, PNM filed application for another 500-kV line to extend from the proposed NMGS to serve utilities in California, and perhaps Arizona. In July 1981, PNM withdrew its application for the out-of-state transmission line.

In response to PNM's applications, the BLM NMSO was designated Lead Agency for the preparation of this Environmental Impact Statement (EIS), in accordance with the provisions of the National Environmental Policy Act (NEPA), the regulations of the Council on Environmental Quality (CEQ, 40 CFR 1500 through 1508), Department Manual 516, and BLM guidance. The BLM New Mexico State Director has the authority to issue all land use grants, permits, and amendments for public lands in New Mexico. Use of these grants and permits would be contingent on the applicant's receipt of the approximately 30 other necessary permits and approvals for NMGS. These are summarized in the Authorizing Actions section of Chapter 1.

Paragon Resources, Inc., a subsidiary of PNM, has proposed to exchange 17,138 acres of private land (Ute Mountain Lands) in Taos County, New Mexico, for approximately 8400 acres of public lands near Bisti, New Mexico. The present use of these Bisti lands is grazing. The proposed end uses include a 2400-acre site for the proposed New Mexico Generating Station (NMGS), a possible future 2400-acre site for a new town, and about 220 acres for a water wellfield and gathering system. The balance of these lands would continue to be used for grazing. This proposed land exchange was the subject of a recent Environmental Assessment (EA) (BLM 1981). Other possible end uses have not been identified but have been suggested by a variety of sources (see the Ute Mountain Land Exchange Final EA). However, since these potential end uses are remote and speculative, they could not be meaningfully addressed in this EIS.

If the land exchange is not approved, other options are available that could make the land available for location of the generating station. These options include such actions as rights-of-way (ROW) grant, sale, or lease. Alternative ways by which the BLM could acquire the Ute Mountain lands include purchase, lease, or donation.

In an effort to avoid duplication, opportunity for early involvement and cooperation in the EIS process has been provided to numerous agencies. This involvement has been provided for by either a formal Cooperative Agreement (on file at BLM NMSO) or an informal letter of cooperation. Cooperating Agencies for this EIS are listed below (*indicates informal cooperating agencies).

- Federal
  Department of Agriculture
  - Soil Conservation Service*
  - U.S. Forest Service
  Department of the Interior
  - Bureau of Indian Affairs
    Albuquerque Area Office
    Eastern Navajo Agency
    Navajo Area Office
  - National Park Service
  - U.S. Geological Survey*

- U.S. Fish and Wildlife Service
- U.S. Bureau of Reclamation

Environmental Protection Agency, Region VI

U.S. Army Corps of Engineers

- State of New Mexico
  Energy and Minerals Department
  Environmental Improvement Division*
  Historic Preservation Bureau*
  Natural Resources Department*
  Public Service Commission*
  State Engineer's Office*
  State Planning Office*

- Tribal
  Navajo Tribe
  Pueblo of Zia

Many of these and other agencies have their own environmental analysis requirements for their permits. Efforts have been made to supply sufficient analyses for use by other agencies. Several agencies have requirements for specifically structured detailed analyses, which would be provided during subsequent permitting processes.

The proposed site for the NMGS is located in the San Juan Basin of northwestern New Mexico (see Map 1-1 in Chapter 1). The BLM is responsible for the management of much of the land and mineral resources in this area, and currently has six separate but interrelated proposals under consideration within the basin. In order to respond to these, the BLM developed the San Juan Basin Action Plan (SJBAP). This plan provides for the organizational arrangements whereby the environmental assessment process and public review can be implemented in a timely and efficient manner. This administrative plan describes the process for preparation of three site-specific EISs, including the NMGS EIS, and three EAs:

- Coal Preference Right Leasing (EA) (completed)
- San Juan River Regional Coal Leasing (DEIS)
- Bisti, De-na-zin, and Ah-shi-sle-pah Wilderness Study Areas (EIS)
- Ute Mountain Land Exchange (EA) (completed)
- New Mexico Generating Station (EIS)
- Bisti Coal Lease Exchange (EA)

The Final Cumulative Overview (CO), which considers the cumulative impacts of these proposed actions, is included in Volume II.

In the preparation of this EIS, reference has been made to these and other relevant environmental documents. This tiered approach incorporates a comprehensive data base without recreation of the information contained in other documents. Documents to which this EIS is related include the San Juan Basin Regional Uranium Study, Star Lake-Bisti Regional Coal EIS, San Juan Grazing Management EIS, and the BLM Chaco-San Juan Management Framework Plan (MFP) Amendments (1981).

LEVEL OF ANALYSIS

New Mexico Generating Station

This EIS focuses on potentially significant impacts associated with the following resource topics: air quality, water quality and quantity, cultural resources, social and economic conditions, Native Americans, paleontological resources, threatened or endangered species, visual and recreation resources, wilderness values, and transportation. Less emphasis is given to resources that are not expected to be significantly affected or of major public concern, such as climate, geology, minerals, and common species of vegetation or wildlife.

The impact analysis for power plant facilities is based upon current specifications for design and operation of power plant systems. In cases where final selection of design features has not been made by the applicant, impact analysis is based on the assumption that applicable regulations and standards would be met.

The assessment for pipelines routes assumed a 90-foot construction disturbance. Generally, the transmission line evaluations assumed a 200-foot ROW centered in a 1-mile study area corridor. If placement of the line elsewhere in the study area would

result in different impact findings, such differences were noted. This EIS is intended to supply information from which a selection of corridors can be made. Once a corridor is selected, centerline surveys would be conducted to identify the exact alignment. Route-specific stipulations would be developed at that time. Site-specific supplemental environmental analyses would be done where necessary.

Impacts of coal handling and processing from the delivery point at the NMGS to the proposed disposal area are addressed in detail. Coal for NMGS would be acquired through negotiated purchase contracts based on the available coal supply in the region.

The site-specific impacts of coal mining have not been repeated in NMGS because the potential coal sources have been addressed in other environmental assessments. A brief summary of impacts of coal mining has been added.

Impacts that would result from NMGS were evaluated assuming environmental conditions as they would be when NMGS would start construction. Since that date is several years away, two existing environments in the San Juan Basin were considered to be in place by that time for the impact analysis. These two existing environments are described in Appendix C. Differences in analysis findings for the two existing environments are discussed where they apply.

Chapter 1

Chapter 1

PROPOSED ACTION AND ALTERNATIVES

PURPOSE OF AND NEED FOR THE PROPOSED ACTION

BACKGROUND

The applicant, Public Service Company of New Mexico (PNM), has submitted to the Bureau of Land Management (BLM) its statement of purpose and need for the New Mexico Generating Station (NMGS) (see Appendix E). The question of whether NMGS is needed has been a recurrent issue in public meetings and written communications for this Environmental Impact Statement (EIS). The ultimate authority for resolving this issue rests with the New Mexico Public Service Commission (PSC) when it considers PNM's application for a Certificate of Public Convenience and Necessity. It is the PSC that regulates PNM's legal mandate to provide electricity when it is needed. PNM has not submitted such application for NMGS. Presentation of PNM materials supporting its statement of need and a discussion of other information on growth projections for New Mexico and the need for electricity are detailed in the Purpose and Need Technical Report. The following discussion presents the applicant's statement of purpose and forecasts of the need for electricity. Relevant communications from PNM to BLM are contained in Appendix E of this EIS. This EIS also covers the possible end uses (other than NMGS) of the Proposed Ute Mountain Land Exchange (see Chapter 1 section on other possible end uses).

PURPOSE

The applicant's statement of purpose states that the major purpose of the project is the generation of electricity using San Juan Basin coal to meet the forecasted need of PNM's system. The applicant indicates that the generation of electricity is needed because of projected demand growth and that the use of coal is desirable because it is available in New Mexico. A coal-fired steam electric generating station also appears to be licensable in PNM's planning time frame.

According to the applicant:

> the purpose of this phase of the New Mexico Generating Station (NMGS) Project is to provide the management of the Public Service Company of New Mexico (PNM) with sufficient information to assess the benefits and risks of developing a coal-fired generating station. This risk and benefit analysis will be evaluated against a full range of options to meet the electrical energy needs of PNM's customers in the 1990s and beyond. Among the options considered by PNM are nuclear, geothermal, solar, hydro, conservation, and others. In order to make the best decision, PNM management requires information related to the feasibility and availability of such coal-related resources as land, water, and fuel. Additionally, PNM management requires information regarding the suitability of the proposed project's impact on the human and natural environments in accordance with the NEPA process. As set forth in the July 10, 1981, letter from PNM to BLM, the proposed project consists of a coal-fired generating station with up to four 500-MW units. The units will be placed in service in the 1990s, with the first possibly as early as May 1990. Associated with the generating station are two 500-kV transmission lines to Albuquerque, a 500-kV tie to the Four Corners-Ambrosia 500-kV lines, and two water pipelines from San Juan River to the generating station.

PNM serves a large part of north-central New Mexico, including Albuquerque, Santa Fe, and other communities. PNM currently serves a total population of about 565,000, of which about 80 percent live in the Albuquerque area (PNM 1981a). The applicant's forecasted need is presented below.

PNM's Historical Electrical Needs

The electrical needs served by PNM grew at an average annual rate of 5.6 percent over the period 1971-1980 and were 3903 gigawatthours (GWh) in 1980, excluding sales for resale. During this period, sales for resale (that is, sales of electricity to another party, which in turn resold the electricity) by PNM grew at a faster rate than direct sales by PNM to end users.

PNM's Assessment of Need

In presenting its assessment of the need for NMGS, PNM has addressed uncertainties about future electrical needs by considering five different scenarios (sets of assumptions) about possible future conditions in New Mexico: low, middle, strong growth, high, and potential industrial. PNM states (Waldman 1982) that "the high and low growth scenarios . . . are intended to bracket the range of growth likely to be achieved within the PNM service area." The strong growth scenario is the average of the middle and high scenarios, and PNM states (PNM 1981b) that it "believes [the strong growth scenario] is the realistic scenario upon which to develop prudent long-term system expansion plans which afford PNM the ability to meet the energy requirements of an economically strong New Mexico economy." PNM has used the strong growth scenario when presenting calculations to show the need for NMGS. PNM further states (PNM 1981b) that the potential industrial scenario is "a scenario whose load [electrical need] estimates are based on actual inquiries and preliminary negotiations with companies considering building large new facilities which would require PNM electric service."

Figure 1-1 shows PNM's assessment of future electrical needs for each of the five scenarios. It also shows PNM's existing and planned generating capacity, both with and without NMGS. These are the same as those analyzed for the DEIS and continue to represent PNM's proposed action. PNM believes that change in future forecasts may show NMGS as being needed as early as 1990. Figure 1-1a, however, presents PNM's most current forecast of need information. The revised information (see Appendix E) reflected in Figure 1-1a was used to extend the analysis for the delay-of-action alternative. With regard to the revised forecasts:

1. The contract with Southwest Public Service (SPS) is included.

2. The forecast projects a lower need for power in the future than the forecast included in the DEIS.

3. The revised material provided does update the forecasts in Appendix A.

4. PNM's revised forecast was based on the information from the Bureau of Business and Economic Research and the latest information available on natural gas prices at the time.

5. No contracted purchases from El Paso Electric are included in the forecast.

6. The forecast does not include New Mexico Electric.

PNM's Need Assessment Process

To prepare the forecasts used in its statement of need for NMGS, PNM used a forecasting model based on trend analysis. This type of model uses historical data on a variety of input variables to develop formulas for estimating the future level of electric sales, given the future levels of the input variables.

PNM's load forecasts are described in detail in "1981-2001 Forecast of Energy Sales and Peak Demands" (PNM 1981c). Forecasts of sales are prepared for five customer classes: residential, commercial, industrial, miscellaneous, and the City of Gallup (a wholesale buyer). Forecasts are developed separately for each operating division, and the results are summed to obtain total sales. Once the models have been used to compute the total energy sales for each category for

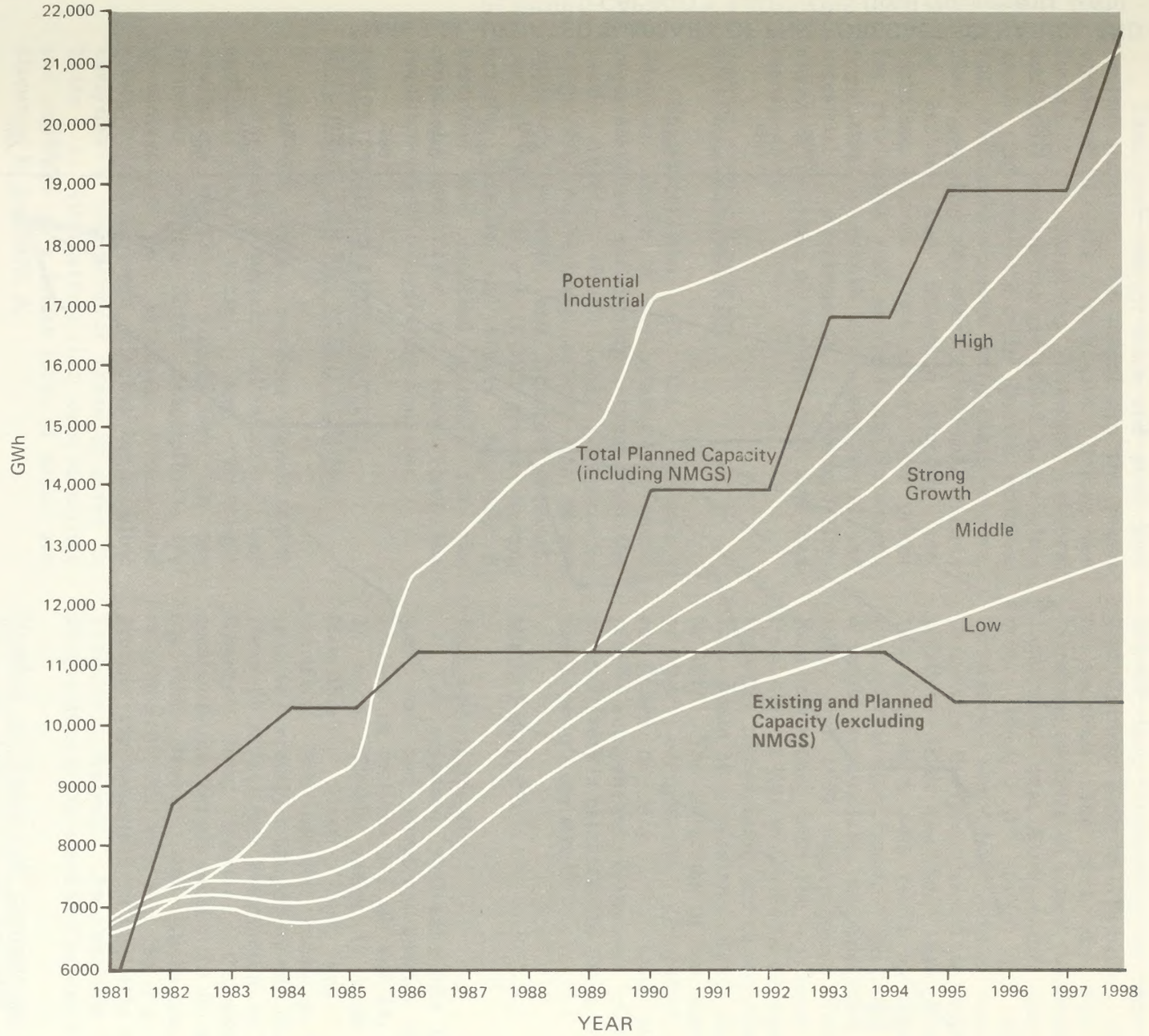


Figure 1-1. SUMMARY OF PNM FORECAST SCENARIOS AND PLANNED CAPACITY ADDITIONS (total requirements, GWh)

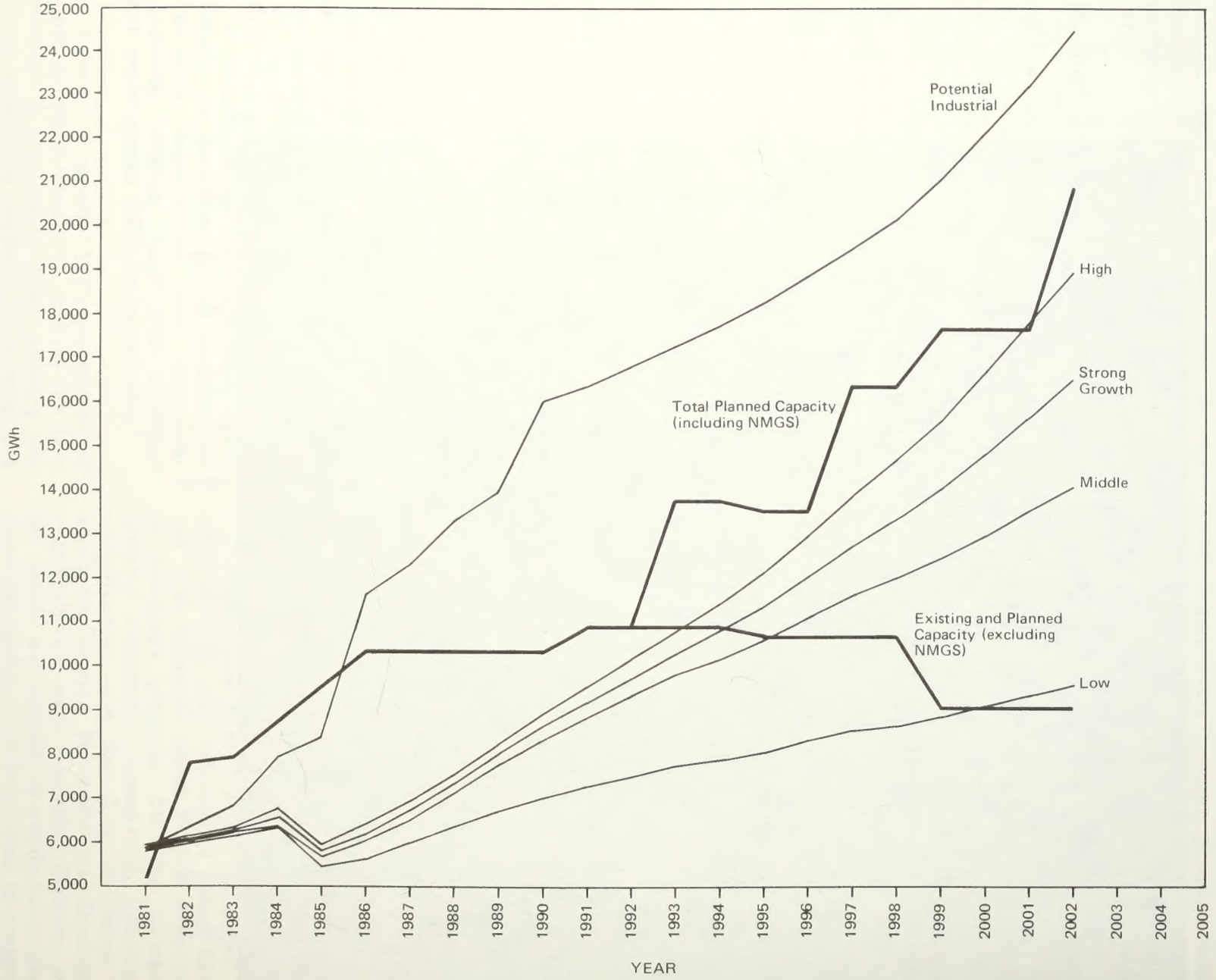


Figure 1-1a. UPDATED SUMMARY OF PNM FORECAST SCENARIOS AND PLANNED CAPACITY ADDITIONS (total requirements, GWh)

each year, the peak demand for the system is computed using historical load factors for each category.

The total energy sales and peak load projections from the model are the major elements of PNM's forecasts. Before the forecast is complete, however, several additional components are added in, including resale contracts with other electric utilities, bulk transmission losses, and system reserve. The forecasting procedure considers a variety of factors that influence electric use, including income levels, natural gas prices for residential and commercial customers, population, household size, commercial and industrial employment, conservation, changing patterns of electric use, and load management.

AUTHORIZING ACTIONS

Implementation of the applicant's Proposed Action or any alternatives would require several authorizing actions from the Lead Agency (BLM) and Cooperating Agencies. Authorizing actions are direct approvals, permits, and licenses required, such as rights-of-way (ROW) grants, stream crossing permits, and others. Appendix F describes the required permits for the proposal, and Table 1-1 summarizes the requirements of Cooperating Agencies.

DESCRIPTION OF ALTERNATIVES, INCLUDING THE PROPOSED ACTION

The EIS process requires identification of reasonable project alternatives and environmental, social, and economic evaluation of these alternatives. In the following section, brief descriptions are presented for the Proposed Action and alternatives that were selected for detailed analysis. A summary of these is given in Table 1-2. Alternatives that were identified and analyzed at a lesser level of detail are discussed in Appendix A.

GENERAL DESCRIPTION AND LOCATION OF PROJECT COMPONENTS

The proposed NMGS, at ultimate development, would have four 500-MW generating units. Fuel for the plant would be obtained from surface coal mines (under existing leases) to be developed near the plant site. Most of the power generated by the plant would be transmitted on a 5-mile 500-kV loop connecting to the approved Four Corners-Ambrosia-Pajarito (FC-A-P) transmission line and on two 500-kV transmission lines to a new sub-station to be constructed near Albuquerque, New Mexico; from there, it would be distributed throughout the PNM service area. Water to operate the plant would be delivered by pipelines from the San Juan River. The first generating unit could be required for commercial operation in 1990; Units 2, 3, and 4 would be available for operation in 1993, 1995, and 1998 respectively. The 500-kV loop connecting with the approved FC-A-P transmission line would be in service in 1990; the first transmission line to the Albuquerque area would be in service in 1993; the second, in 1998. The locations of the above major project components (Proposed Action) are shown on Map 1-1. Land status for project components (Proposed Action and alternatives) is presented in Table 1-3 and on the maps in Appendix G.

NMGS PROJECT

Proposed Station Site

The proposed 2400-acre site is in the south half and northwest quarter of section 13, and in sections 14, 23, and 24, township 23 north (T23N), range 13 west (R13W), New Mexico base line and principal meridian. This location, known as the Bisti site, is currently managed by the BLM and is about 35 miles from Farmington, in San Juan County, New Mexico. Currently, the southeast quarter of section 13 is withdrawn for the Navajo Land Exchange. PNM's selection of this site and its site selection process are described in the Site Selection Technical Report. An analysis of site alternatives is discussed in Chapter 3.

Number of Units and Completion Schedule

Proposed Action. Four 500-MW units are planned for the Proposed Action, to be completed in 1990, 1993, 1995, and 1998. According to the applicant, significant economic benefits would be derived by utilizing common facilities for water, fuel, and pollution control.

Table 1-1. POTENTIALLY REQUIRED PERMITS, APPROVALS, NOTIFICATIONS, AND CONSIDERATIONS FOR PROPOSED ACTION AND ALTERNATIVES

Responsible Agency	Potentially Applicable Permits, Approvals, Notifications, and Considerations	Power Plant Facilities	Water Supply		Intake Structure & Pipe-Line P1	Intake Structure & Pipe-Line P2	Intake Structure & Pipe-Line P3	Transmission Line T1	Transmission Line T2	Transmission Line T3	Transmission Line T4	Reservoir R1	Reservoir R2
			Surface Water	Ground Water									
Joint Responsibility: U.S. EPA and NMEID	PSD Permit	X											
U.S. EPA	New Source Performance Review Notification	X											
NMEID	Permit to Construct	X											
U.S. Bureau of Reclamation	Contract with Secretary of Interior for Navajo Reservoir Water		X										
	Congressional Approval of New Contracts for Navajo Reservoir Water		X										
Army Corps of Engineers	404 Permit				X	X	X						
U.S. EPA	NPDES Permit	X			X	X	X						
New Mexico State Engineer	Permit to Appropriate the Underground Waters of the State of New Mexico			X									
	Permit to Appropriate the Surface Waters of the State of New Mexico											X	X
	Point of Diversion Permit				X	X	X						
NMEID	Notice of Intent to Discharge	X			X	X	X						
	Discharge Plan				X	X	X						
	Sewage Treatment Design Review	X											
U.S. Department of Interior	Emergency Procedures for Consideration of Historic and Cultural Properties Discovered during Construction	X		X	X	X	X	X	X	X	X	X	
New Mexico State Highway Department	Permit to Install Utility Facilities within Public ROW				X	X	X	X	X	X	X		

Table 1-1. POTENTIALLY REQUIRED PERMITS, APPROVALS, NOTIFICATIONS, AND CONSIDERATIONS FOR PROPOSED ACTION AND ALTERNATIVES (continued)

Responsible Agency	Potentially Applicable Permits, Approvals, Notifications, and Considerations	Power Plant Facilities	Water Supply		Intake Structure & Pipe-Line P1	Intake Structure & Pipe-Line P2	Intake Structure & Pipe-Line P3	Trans-mission Line T1	Trans-mission Line T2	Trans-mission Line T3	Trans-mission Line T4	Reser-voir R1	Reser-voir R2
			Surface Water	Ground Water									
Bureau of Land Management	ROW Grant, Sale, Lease, or Exchange	X											
	ROW Grant and Temporary Use Permits (Note: BLM as Lead Agency has Responsibility for NEPA Compliance,[a] Including Protection of Wetlands [Exec. Order 11990], Floodplain Management [Exec. Order 11988])		X	X	X	X	X	X	X	X	X		
			X		X	X	X						
	Section 7 Compliance[a] (End. Species Act and New Mexico Wildlife Conservation Act)	X	X	X	X	X	X	X	X	X	X	X	X
	Section 106 Compliance[a]	X		X	X	X	X	X	X	X	X	X	X
	Compliance with Exec. Order 11593[a] (Protection and Enhancement of the Cultural Environment)	X		X	X	X	X	X	X	X	X		
	Noncompetitive Sale of Mineral Materials	X			X	X	X	X	X	X	X		
	Permit for Firewood										X		
Bureau of Indian Affairs	Tribal, BIA, and Secretary of Interior Approval of Rights-of-Way				X	X	X	X	X		X		
U.S. Forest Service	Special Use Authorization										X		
Federal Aviation Administration	Notice of Proposed Construction or Alteration of Objects Affecting Navigable Airspace	X											
	Notice of Proposed Construction or Alteration, Activation, Deactivation, or Other Change in Airport Status	X											
Federal Communications Commission	Private Operational Microwave Service License				X	X	X						

Table 1-1. POTENTIALLY REQUIRED PERMITS, APPROVALS, NOTIFICATIONS, AND CONSIDERATIONS FOR PROPOSED ACTION AND ALTERNATIVES (concluded)

Responsible Agency	Potentially Applicable Permits, Approvals, Notifications, and Considerations	Power Plant Facilities	Water Supply		Intake Structure & Pipe-Line P1	Intake Structure & Pipe-Line P2	Intake Structure & Pipe-Line P3	Transmission Line T1	Transmission Line T2	Transmission Line T3	Transmission Line T4	Reservoir R1	Reservoir R2
			Surface Water	Ground Water									
New Mexico Public Service Commission	Certificate of Public Convenience and Necessity	X											
	Location Permit	X											
New Mexico State Land Office	ROW Easements				X	X	X	X	X	X			

[a]Compliance is also the responsibility of other federal agencies such as the Bureau of Indian Affairs and the Forest Service, where applicable.

Table 1-2. SUMMARY OF ALL PROJECT COMPONENT ALTERNATIVES CONSIDERED AND THOSE SELECTED FOR ANALYSIS

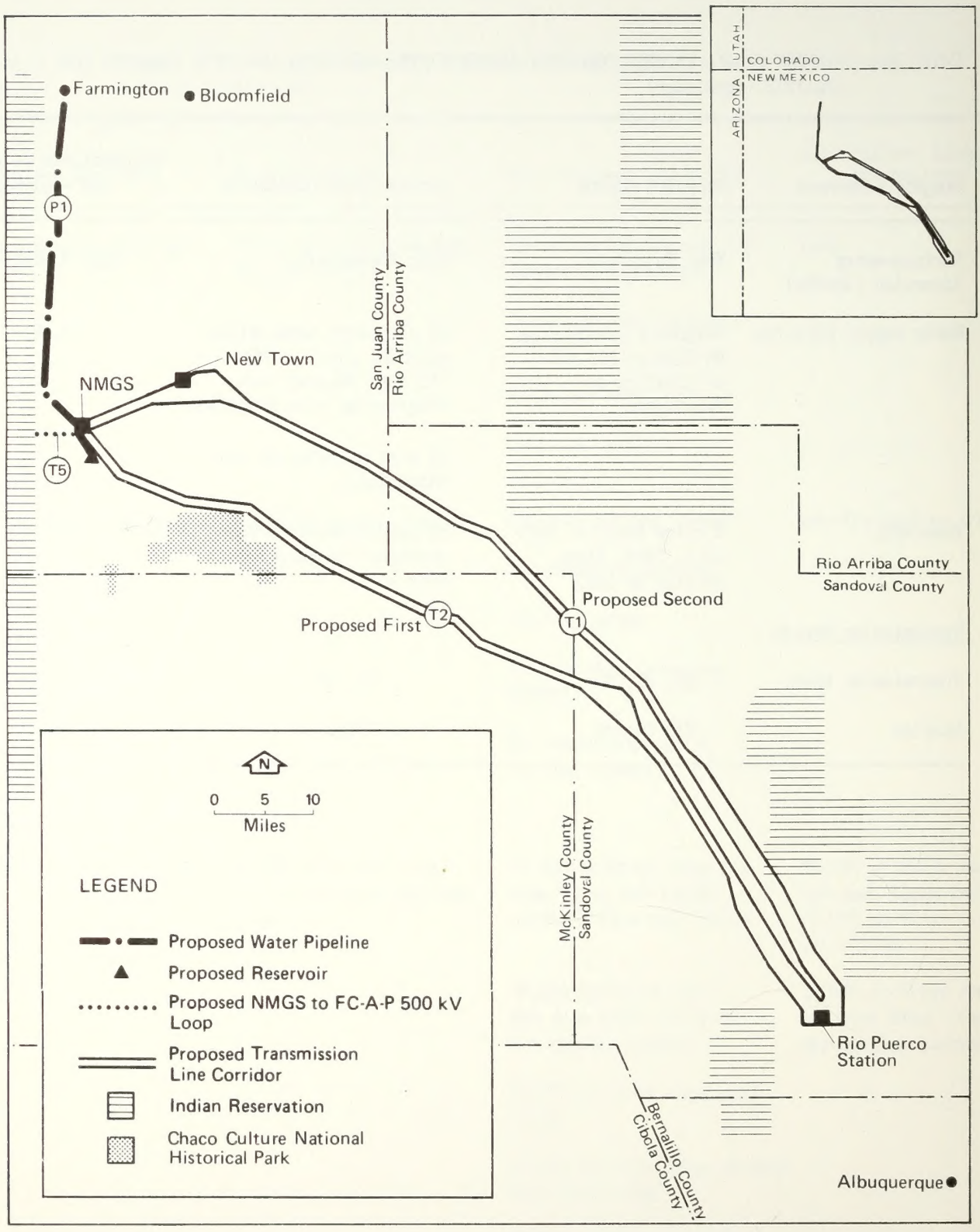
	Proposed Action	Alternatives Considered	Alternatives Selected for Analysis
NMGS	Four 500-MW coal-fired units completed 1990-2000	No action (other means of providing for need) Delay of action	No action Delay of action
Project Component			
Site	Bisti	McKinley County Torrance County	McKinley County Torrance County
Fuel Supply System			
Coal supply	Sunbelt and Arch Minerals joint venture	Other San Juan Basin coal producers Coal sources outside San Juan Basin	Other San Juan Basin coal producers
Coal handling	Trucked to NMGS site, conveyor belt to active and emergency storage piles on-site	Coal transported by conveyor belt to site and then to power plant Off-site storage of run-of-mine coal	Coal transported by conveyor belt and then to power plant Off-site storage of run-of-mine coal
Pollution Control Systems			
Particulate removal	Fabric filter	Electrostatic precipitator	Electrostatic precipitator
SO_2 control	One of the following: • Wet limestone scrubbing • Alkali spray-drying	Wet limestone scrubbing, lime spray-drying, dry types, regenerable types	None
NO_x control	One of the following: • Dual-register burner • Tangentially fired steam generation • Controlled-flow/ split-flame burner	Low NO_x boiler design, flue gas recirculation	None

Table 1-2. SUMMARY OF ALL PROJECT COMPONENT ALTERNATIVES CONSIDERED AND THOSE SELECTED FOR ANALYSIS (continued)

Project Component	Proposed Action	Alternatives Considered	Alternatives Selected for Analysis
Solid waste disposal	Return to coal mine for layered disposal	Marketing of fly ash for commercial products	None
		Random dumping in mined-out pits	
		Off-site landfill	
		On-site landfill	
Heat Rejection System	Wet-type cooling towers	Wet-dry cooling towers	Wet-dry cooling towers
		Once-through cooling	
		Cooling ponds	
		Natural-draft cooling towers	
		Dry mechanical-draft cooling towers	
Water Supply System			
Water supply sources	35,000 acre-feet/year (ac-ft/yr) from San Juan River	20,000 ac-ft/yr from San Juan River and 15,000 ac-ft/yr from well field	20,000 ac-ft/yr from San Juan River and 15,000 ac-ft/yr from well field
		20,000 ac-ft/yr from San Juan River (if wet/dry-cooling towers)	20,000 ac-ft/yr from San Juan River (wet/dry-cooling towers)
		35,000 ac-ft/yr from well field	
		35,000 ac-ft/yr from uranium mine dewatering	
		20,000 ac-ft/yr from San Juan River and 15,000 ac-ft/yr from uranium mine dewatering	
		McElmo Creek Unit (of the Colorado River Water Quality Improvement Program	

Table 1-2. SUMMARY OF ALL PROJECT COMPONENT ALTERNATIVES CONSIDERED AND THOSE SELECTED FOR ANALYSIS (concluded)

Project Component	Proposed Action	Alternatives Considered	Alternatives Selected for Analysis
Surface-water diversion (intake)	Near Farmington	Near Bloomfield	Near Bloomfield
Water supply pipeline	Alignment paralleling NM Highway 371 (P1), originating at Farmington	P2 alignment paralleling existing pipeline ROW (El Paso Natural Gas), originating near Bloomfield P3 also originating near Bloomfield	P2, P3
Reservoir	2 miles south of NMGS site, T23N, R13W, Section 36 (R1)	R2 approximately 3 miles southeast of proposed NMGS site	R2
Transmission System			
Transmission Lines	T5, T2, T1	T3, T4	T3, T4
Station	Rio Puerco	None	None



Note: For more information, see the location maps in Appendix G.

Source: BLM 1982.

Map 1-1. GENERAL LOCATION OF PROPOSED ACTION

Table 1-3. OWNERSHIP OF LANDS AFFECTED BY THE PROPOSED ACTION AND COMPONENT ALTERNATIVES

Project Components (Proposed Action and Alternatives)	BLM	State	BIA	Forest Service	Private
NMGS					
Plant Site	2400 ac	--	--	--	--
Water Supply System					
P1[a]	23.6 mi	0.37 mi	14.2 mi	--	1.3 mi
P2[b]	14.6 mi	0.37 mi	24.8 mi	--	2.7 mi
P3[b]	36.2 mi	7.2 mi	0.3 mi	--	2.1 mi
R1	--	640 ac	--	--	--
R2	320 ac	--	--	--	--
Transmission System[c]					
T5	1.0 mi	--	4.0 mi	--	--
T2	33.6 mi	6.3 mi	38.6 mi	--	21.2 mi
T1	64.4 mi	11.9 mi	19.4 mi	--	10.9 mi
T3	37.3 mi	13.1 mi	37.9 mi	--	16.3 mi
T4	4.7 mi	--	39.8 mi	10.3 mi	60.3 mi

Note: The number of miles of land that would be traversed by the transmission line ROW was calculated assuming placement centered in the study area corridor shown in Appendix G. Acreage that would be affected by the proposed or alternative transmission lines or pipelines can be calculated by using the following conversion factors:

Water pipelines (90-ft ROW):	10.90 ac/mi
Transmission lines (200-ft ROW):	24.24 ac/mi

[a]The proposed intake pumping plant (35 acres) associated with P1 is on private land.

[b]The alternative intake pumping plant (35 acres) associated with P2 and/or P3 is on private land.

[c]The proposed Rio Puerco Station (109 acres) is on private land.

Fuel Supply System

Coal Supply.

Proposed Action. Coal for NMGS would be acquired through negotiated purchase contracts, based on the available coal supply in the region. A number of potential suppliers have expressed interest in negotiating supply contracts. Sunbelt Mining Company, a wholly owned subsidiary of PNM, owns and has started production at the De-na-zin Mine, which is within 2 miles of the proposed NMGS. Further, the Sunbelt Mining Company is negotiating with Arch Minerals Company for additional coal reserves, located adjacent to Sunbelt Mining Company's Bisti coal leases. The Proposed Action would be to supply coal necessary for the operation of NMGS from a joint venture of Sunbelt and Arch Minerals Company. In this EIS the joint venture is referred to as the Bisti coal mine.

In a given year of full production, four separate mine pits may be needed to supply the necessary coal. Coal would be hauled from the four mining areas to a receiving facility located near the northern boundary of the proposed NMGS site. This receiving facility would be a truck dump pit. Bottom-dumping coal trucks would drop the coal through a grate into a coal hopper. The hopper would discharge into the primary coal crusher, which in turn would discharge onto a conveyor that would transport the coal to power plant facilities. Haul roads would link the four mine areas to the receiving facility. Dust from haul-truck activity would be controlled by spraying the haul roads with water. Water consumption for haul-road dust suppression would average approximately 122 acre-feet per year. The haul roads would be designed to control runoff and erosion. Locations of haul roads would change as the various mine fronts advanced. Abandoned haul roads would be reclaimed according to regulatory requirements.

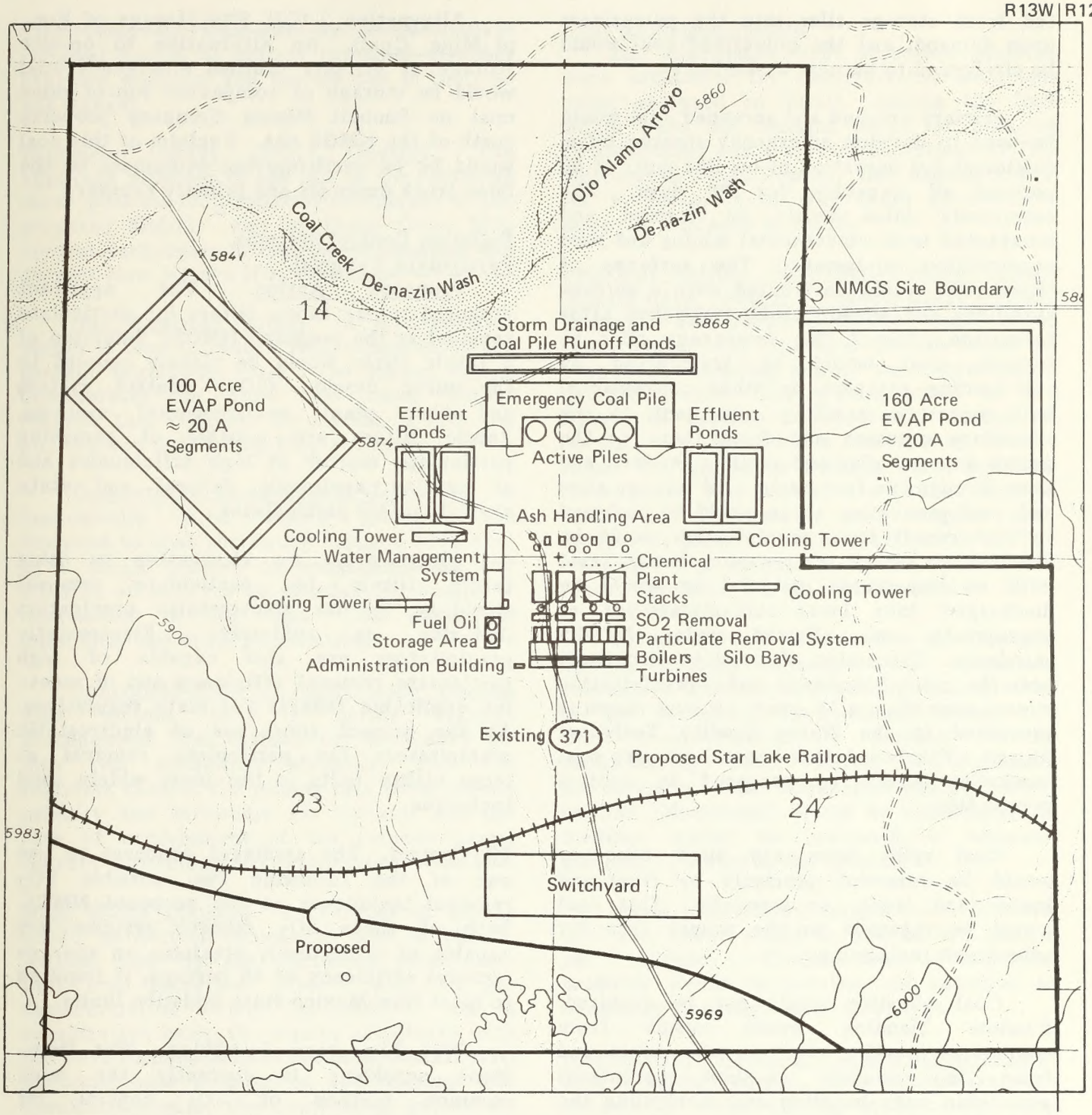
Alternative (Other San Juan Basin Coal Producers). Other potential coal producers in the San Juan Basin have expressed interest in supplying coal to the NMGS. These potential coal sources would be capable of supplying large quantities of coal having properties essentially the same as Bisti coal. There is an estimated 4 billion tons of strippable subbituminous coal reserves within 30 miles of the NMGS site. Other potential San Juan Basin coal sources were selected as reasonable alternatives to be assessed, since another coal source (or sources) in the vicinity of NMGS might be used, based on cost considerations.

Coal would be hauled by truck from mining areas within the San Juan Basin to a receiving facility near the NMGS site. Mining procedures would be as described above. A worst case, in which 9 million tons of coal would be required annually, is assumed to describe the transportation requirements for this alternative. Further assumptions include: one-way haulage of 30 miles (worst case), 120-ton trucks, 250 haul days per year. The use of New Mexico State Highway 371 (NM 371) for hauling was assumed.

Based on these assumptions, approximately 300 round trips per haul day would be required. Total mileage per haul day would be approximately 18,000 miles. Design and maintenance of haul roads would be similar to that described for the Proposed Action.

Coal Handling System. Because final design of the coal-handling system would not be specified until the coal supply selection is completed, assumptions concerning the system were made to allow the evaluation of expected environmental impacts.

Proposed Action. Within the power plant area, coal transfer and handling would be accomplished by a covered conveyor system. Primary crushed coal, approximately 4-inch diameter and smaller, would be received directly north of NMGS and adjacent to the site boundary. Coal would be transferred via conveyor belt from the receiving station to enclosed secondary crushers and then to four open, active storage piles (Figure 1-2). Active storage piles, sufficient for 3 days of full plant operation, would be formed by dropping the crushed coal from a conveyor through a lowering well. All coal handling and processing after active storage would be enclosed, for dust control. Coal from active storage piles would be conveyed to the plant coal silos (above the pulverizers). It would be



Source: PNM 1982.

Figure 1-2. STATION LAYOUT

fed from storage silos into the pulverizers upon demand, and the pulverized coal would be air-forced to burners in the boilers.

Primary crushed and screened coal would be used to develop emergency storage piles, sufficient for operation of on-line units at 80 percent of capacity for 90 days. The emergency piles would be formed and compacted with conventional mining and road construction equipment. The surfaces of these piles would be treated with a surface stabilizer and would not be trafficked after formation. Should the emergency piles be tapped, coal would be transferred by self-loading scrapers or other conventional bulk materials handling equipment to the secondary crushers and from there to the active storage piles and reclaim feeders, and then through the fuel cycle. All storage piles and coal-processing areas would be designed so that runoff from precipitation would be diverted to runoff evaporation basins lined with an impervious material or would be discharged into local streams/arroyos as appropriate and allowed under NPDES standards. Discussion of possible discharges past the plant boundaries under precipitation events exceeding a 10-year, 24-hour storm is presented in the Water Quality Technical Report. The foundation beneath on-site coal stockpiles would be prepared to control percolation.

Coal spills from any plant conveyor would be removed promptly by front-end loader and truck, or manually. This coal would be returned to the proper area for subsequent reclaiming.

Coal blending would not be required. Random blending would result from concurrent working of four mine areas and from the routine in-plant operations associated with handling and stockpiling the coal. Plant fuel and emission control systems would be designed to use unblended run-of-mine San Juan Basin coals.

Alternative 1 (Conveyor Delivery to Plant Site). Primary crushed coal could be delivered from the mine to the receiving station by conveyor. If conveyors were used, unloading hoppers would be eliminated at the station and coal would be transferred directly to the plant conveyor and storage piles.

Alternative 2 (Off-Site Storage of Run-of-Mine Coal). An alternative to on-site storage of primary crushed emergency coal would be storage of compacted run-of-mine coal on Sunbelt Mining Company property north of the NMGS site. Reclaim of this coal would be by earth-moving equipment to the mine truck dump pit and primary crusher.

Pollution Control Systems

Particulate Removal.

Proposed Action. The applicant proposed to use fabric filters for particulate removal at the proposed NMGS. Selection of a fabric filter would be closely coupled to the sulfur dioxide (SO_2) control system and other plant environmental systems. Fabric filters are capable of removing particulate matter at high efficiencies and of meeting applicable federal and state regulations for particulates.

Alternative. An alternative to using fabric filters for particulate removal would be to use electrostatic precipators (hot-side or cold-side). Electrostatic precipitators are also capable of high particulate-removal efficiency and of meeting applicable federal and state regulations. At the present time, use of electrostatic precipitators for particulate removal at large utility units is the most widely used technique.

SO_2 Control. The applicant proposes to use one of the following two possible SO_2 removal techniques at the proposed NMGS. Both of these SO_2 control systems are capable of consistently attaining an average removal efficiency of 80 percent, if required to meet New Mexico state emission limits.

Wet Limestone Scrubbing. Wet limestone scrubbing is currently the most common method of SO_2 control for treatment of utility boiler combustion gases. In this system, limestone ($CaCO_3$) additive is crushed, slurried with water, and used as an alkaline spray to absorb SO_2 from the flue gas.

Alkali Spray-Drying. The spray absorber process is a relatively recent development in combustion gas cleaning technology. It is a two-stage SO_2 and particulate removal process that uses a spray absorber/dryer for

SO_2 removal, followed by a particulate removal device to collect the solid scrubber reaction products and the fly ash in the flue gas stream.

Nitrogen Oxides (NO_x) Control. The applicant proposes to use one of the following three possible NO_x removal techniques at the proposed NMGS. Any of these three NO_x control techniques is capable of meeting the current New Mexico NO_x standards.

Dual-Register Burner. A dual-register burner is used to reduce NO_x emissions to the present regulation level. The burner design incorporates an inner and outer burner register that controls the mixing of fuel and air, thereby controlling NO_x emissions.

Tangentially Fired Steam Generator. A tangentially fired steam generator is designed so that the entire furnace area acts as a single burner, allowing fuel-rich and air-rich streams to be blended for complete combustion of the fuel. This design is inherently low in NO_x formation.

Controlled-Flow / Split-Flame Burner. This system uses a series register arrangement that divides the secondary air into two concentric streams. The two registers control the mixing rate between the primary and secondary air streams and the rate of entrainment of the furnace gases, thereby controlling NO_x emissions.

Solid Waste Disposal. Four types of wastes would be derived from coal used in NMGS: bottom ash, fly ash (including economizer ash), coal pulverizer rejects, and flue gas desulfurization (FGD) by-product. On a quantitative basis, the wastes associated with the coal burning process would be the largest, including coal preparation (pulverizing) and desulfurization of the combustion gases. On a volumetric basis, the estimated average production of coal-derived wastes would be about 1475 acre-feet per year (ac-ft/yr) with four units operating, or 59,000 ac-ft over a 40-year plant life.

It is proposed that these solid wastes be disposed of by layering them in previously mined portions of the coal source mines. The wastes would be hauled from NMGS to the coal mines by end-dump trucks.

Heat Rejection System

Six alternative heat rejection systems were identified for consideration with two being analyzed in detail. Among the four which were not brought forth for detailed consideration was a system comprised of Dry Mechanical Draft Towers. See Appendix A-5 for a discussion of why these alternatives were not analyzed in detail.

Proposed Action: Wet-Type Cooling Towers (Evaporative Cooling / Forced-Draft Cooling Towers). The Proposed Action would be to construct a heat rejection system based on evaporative cooling and to use forced-draft cooling towers. The system would be designed to operate satisfactorily during all normal and foreseeable emergency conditions. Cooling-tower makeup water would be drawn from the nearby raw water storage reservoir. This water may require pretreatment prior to cooling-system use. The makeup water would replace the tower losses from evaporation, drift, and blowdown.

As water evaporates from a closed-cycle cooling system, dissolved and suspended substances become increasingly concentrated in the remaining recirculating water. To limit concentrations, a portion of the recirculating water would be withdrawn continuously. The discharged cooling water, termed "blowdown," would be replenished by makeup water to maintain a constant quantity of water in the system.

Typical blowdown ranges for a 500-MW unit wet tower would be 100 to 300 gallons per minute. Cooling-tower blowdown probably would be treated and recycled as necessary to achieve zero discharge.

Alternative: Wet/Dry Cooling Towers (Hybrid Wet/Dry System). This alternative consists of a water-cooling system employing both dry and conventional wet towers. A combination of wet- and dry-cooling towers would require less than 25 acres of land area and would require additional aboveground hardware items over what wet-cooling towers alone would require. The wet towers would be designed to operate mainly during the summer and the dry towers to operate mainly during cold weather. Capabilities of these two cooling systems would be combined to condense the turbine exhaust steam in a

dual-service condenser. The net result would be a power plant that could use conventional low- back-pressure turbines and still meet reduced makeup water requirements.

WATER SUPPLY SYSTEM

The water requirement for NMGS, with four units operating at rated capacity, would be 35,000 ac-ft/yr. This requirement is based on the proposed heat rejection system using wet-cooling towers. An alternative of NMGS use of 35,000 ac-ft/yr of ground water was not identified for consideration in this EIS because obtaining that large amount of ground water was not found technically/ economically feasible within the planning time frame for NMGS. Appendix I gives the current status of PNM's efforts to obtain San Juan River water and describes issues related to the availability of water. Alternatives using 20,000 and 35,000 ac-ft/yr are described below.

Water Supply Source

For a detailed discussion of water supply source alternatives, see the Hydrology Technical Report.

Proposed Action. The applicant proposes to use 35,000 ac-ft/yr (average discharge of 48 cfs) of water from the Navajo Reservoir (San Juan River) by acquiring an allocation of contract water or negotiating for use of allocations. Included in the proposed action is an assignment from Utah International Inc. to Paragon Resources Inc. (wholly owned subsidiary of PNM) of a right to consumptively use 20,000 ac-ft/yr of water from Navajo Reservoir. This right is based on a contract and amendatory contracts between Utah International Inc. and the United States (Contract No. 14-06-400-4831), which provide, among other things, for release of 44,000 ac-ft/yr from Navajo Reservoir and consumptive use of up to 35,300 ac-ft/yr of this water. The term of the contract for water service from Navajo Reservoir continues to December 31, 2005, unless an extension is approved by Congress (see Appendix I for background information). The Bureau of Reclamation as Contracting Officer has the right to approve or disapprove this assignment.

The purpose of and need for the proposed assignment of 20,000 ac-ft/yr of water from Utah International Inc. to Paragon Resources Inc. are, in part, for consumptive use as the water supply source for NMGS. The assignment of 20,000 ac-ft/yr of Utah International's contract water from Navajo Reservoir would be part of the Proposed Action water supply source for NMGS (see p. 3-1 of Hydrology TR). This assumption was based on a letter of intent between Paragon and Utah International at the time the DEIS was being prepared.

The alternative to the assignment of 20,000 ac-ft/yr of water from Navajo Reservoir is the No-Action alternative. The No-Action alternative is that Utah International Inc. would not assign, and thereby retain, all of its rights to contract water from Navajo Reservoir. The consequences of no action are not analyzed in detail, because water uses by Utah International Inc. are assumed to be the same as described and analyzed in the Final Environmental Statement for the WESCO project. If Utah International Inc. is unable to put this water to beneficial use in the authorized time frame, the water would be subject to reallocation.

The proposed action water supply source also includes use of another 15,000 ac-ft/ yr of water from Navajo Reservoir, if available. PNM made an informal request of the New Mexico Interstate Stream Commission in 1982 for this additional water.

The water requirements for NMGS are discussed in Section 2.8.1 of the Project Description TR (see especially Figure 2-3). In summary, a maximum of 34,560 ac-ft/yr is required for power-plant water uses, which assumes four 500 MW (net) units, 100 percent wet-cooling towers, and a 100 percent capacity factor. A total consumptive use of 35,000 ac-ft/yr of water for NMGS was assumed for evaluation of the environmental consequences. This value is conservative because the average annual capacity factor for NMGS may actually be less than 100 percent, which would correspond to less water consumption.

Alternative 1 (20,000 Ac-Ft/Yr from San Juan River, 15,000 Ac-Ft/Yr Ground Water). Paragon Resources, a subsidiary of PNM, has applied to the New Mexico State Engineer for rights to 40,000 ac-ft/yr of ground water to be developed from wells in the vicinity of NMGS. If the use of more than 20,000 ac-ft/yr of San Juan River water cannot be acquired, the applicant would develop a well field in the vicinity of NMGS to supply an additional 15,000 ac-ft/yr for the proposed wet-cooling system.

The wells would extract water from the Westwater Canyon Member of the Morrison Formation, about 4000 to 6000 feet below the ground surface in the project vicinity. Preliminary estimates indicate that potential well yields would be 100-1000 gallons per minute.

The Paragon Resources application for rights to ground water specifies 16 locations for wells in the vicinity of NMGS. The wells would be widely spaced, so collecting pipeline systems and new access roads would be necessary to develop a water supply from this source. Application for access roads and collection systems has been made to the BLM Albuquerque District Office. Impacts associated with this wellfield and gathering system are analyzed in this EIS in the section called Other Possible End Uses of the Ute Mountain Land Exchange.

Alternative 2 (20,000 Ac-Ft/Yr from San Juan River). This alternative consists of the use of 20,000 ac-ft/yr (from the San Juan River) in conjunction with the wet- and dry-cooling system alternative.

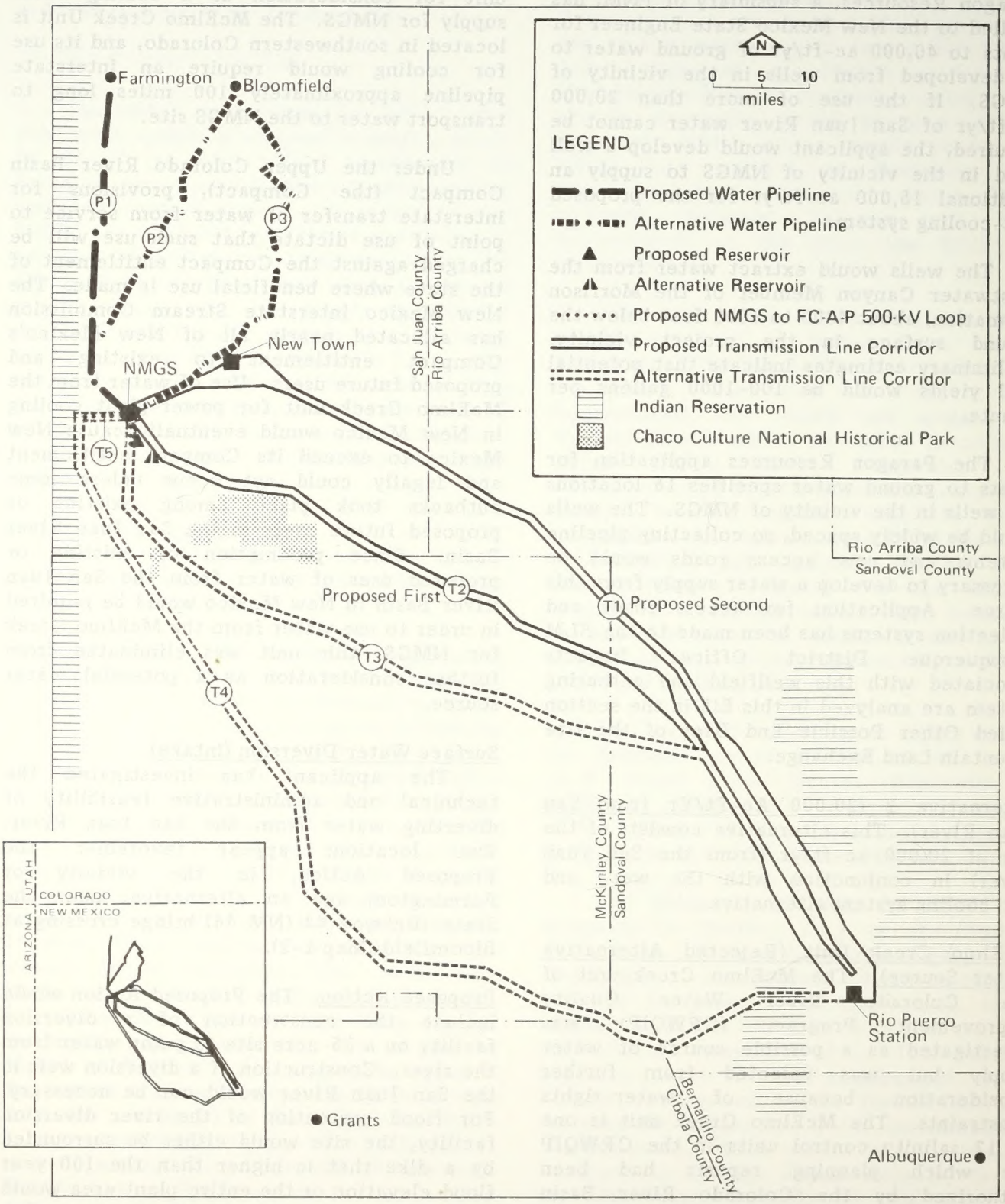
McElmo Creek Unit (Rejected Alternative Water Source). The McElmo Creek unit of the Colorado River Water Quality Improvement Program (CRWQIP) was investigated as a possible source of water supply but was rejected from further consideration because of water-rights constraints. The McElmo Creek unit is one of 12 salinity control units in the CRWQIP for which planning reports had been authorized by the Colorado River Basin Salinity Control Act (Public Law 93-320). A report prepared by the Bureau of Reclamation in September, 1981, entitled "Saline Water Use and Disposal Opportunities," identified the McElmo Creek unit for consideration as a cooling-water supply for NMGS. The McElmo Creek Unit is located in southwestern Colorado, and its use for cooling would require an interstate pipeline approximately 100 miles long to transport water to the NMGS site.

Under the Upper Colorado River Basin Compact (the Compact), provisions for interstate transfer of water from service to point of use dictate that such use will be charged against the Compact entitlement of the state where beneficial use is made. The New Mexico Interstate Stream Commission has allocated nearly all of New Mexico's Compact entitlement to existing and proposed future users. Use of water from the McElmo Creek unit for power-plant cooling in New Mexico would eventually cause New Mexico to exceed its Compact entitlement and legally could not occur unless some cutbacks took place among existing or proposed future users in the San Juan River Basin. Since preemption of existing or proposed uses of water from the San Juan River Basin in New Mexico would be required in order to use water from the McElmo Creek for NMGS, this unit was eliminated from further consideration as a potential water source.

Surface Water Diversion (Intake)

The applicant has investigated the technical and administrative feasibility of diverting water from the San Juan River. Two locations appear favorable: the Proposed Action, in the vicinity of Farmington; and an alternative, near the State Highway 44 (NM 44) bridge crossing at Bloomfield (Map 1-2).

Proposed Action. The Proposed Action would include the construction of a diversion facility on a 35-acre site to pump water from the river. Construction of a diversion weir in the San Juan River would not be necessary. For flood protection of the river diversion facility, the site would either be surrounded by a dike that is higher than the 100-year flood elevation or the entire plant area would be filled to above this flood elevation. The Proposed Action location for the river diversion facility is near Farmington, New



Note: For more information, see the location maps in Appendix G.

Source: BLM 1982.

Map 1-2. GENERAL LOCATION OF ALTERNATIVES INCLUDING THE PROPOSED ACTION

Mexico, approximately 1000 feet upstream of the confluence of the San Juan and Animas rivers.

Alternative. In the 100-year floodplain, an alternative location for river diversion facilities would be located on a 35-acre site approximately 600 feet downstream of the NM 44 bridge crossing at Bloomfield (Map 1-2). Construction and design specifications would be the same as for the Proposed Action.

Water Supply Pipeline System

Details of construction methods and operation of this system are described in Appendix B.

Proposed Action (P1). Two underground 42-inch main water pipelines would be needed to carry 35,000 ac-ft/yr, as is proposed. Both pipelines would be placed within the same ROW. The approximately 40-mile proposed initial main water pipeline (P1) would transport 16,000 to 18,000 ac-ft/yr of water (starting in 1990) from an intake pumping plant on the San Juan River near Farmington to the proposed terminal storage reservoir approximately 2 miles south of NMGS. The proposed pipeline route would be located within the new and old portions of the NM 371 ROW for approximately 75 percent of its length. An intake pumping plant and three booster pump stations would lift the water to the high point of the proposed pipeline route near Moncisco Mesa (Milepost [MP] 17 in Appendix G maps). From there the water would flow by gravity to the storage reservoir near NMGS.

The proposed initial main water pipeline would supply water for NMGS Units 1 and 2. A second main water pipeline would be constructed in 1995 for NMGS Units 3 and 4. This second pipeline would start at the first intermediate pump station site (MP 0.8 of the first main water pipeline route) and would terminate at the storage reservoir near NMGS. The second main water pipeline would have a capacity to transport 16,000 to 18,000 ac-ft/yr of water for NMGS Units 3 and 4.

Alternative P2. This approximately 43-mile alternative main water pipeline route would initiate from an intake pumping plant on the San Juan River near Bloomfield and would terminate at the proposed terminal storage reservoir near NMGS. This alternative pipeline route would follow a southerly course for about a half-mile through a suburban residential area and then join an existing pipeline ROW (El Paso Natural Gas). The alternative pipeline route would cross and then generally parallel this ROW on the southern side to the crossing of old NM 371 (north of Bisti Trading Post), where it would join the proposed main water pipeline route at MP P1-29.5. P2 would parallel an existing ROW for about 85 percent of its total length. The last 10 miles of this alternative route is the same as the proposed main water pipeline route (P1). Approximately 19 miles of Navajo Indian Irrigation Project (NIIP) lands would be crossed by this alternative route; the Main Irrigation Conveyance System Canal and the future Burnham Pump Lateral would be crossed at MP P2-11 and MP P2-25, respectively. No new access roads would be required for construction of the four intermediate pump stations associated with this alternative. An intake pumping plant and four intermediate pump stations would be required to transport the approximately 16,000 to 18,000 ac-ft/yr of water (starting in 1990) required for NMGS Units 1 and 2. As with the proposed main water pipeline, a second main water pipeline (running parallel and adjacent to the initial pipeline) would be constructed at a later date (1995 completion date) for NMGS Units 3 and 4. Incremental increases in the amount of water to be transported by the second pipeline would be the same as for the proposed main water pipeline.

Alternative P3. This approximately 49-mile alternative would also start from an intake pumping plant on the San Juan River near Bloomfield and would also terminate at the proposed terminal storage reservoir near NMGS. This alternative pipeline route is in common with main water pipeline alternative P2 for the first mile or so, and then it crosses over to the east side of NM 44. At approximately MP P3-20 this route alternative crosses back over NM 44 and then runs almost due south for approximately 8 miles, at which point it turns southwest and continues to the proposed terminal storage reservoir near NMGS. P3 would parallel an

existing ROW for about 46 percent of its total length. This route alternative would avoid crossing the NIIP system, although it would cross over the Main Irrigation Conveyance System Tunnel 4. This alternative would traverse the Kutz Canyon Badlands between MP P3-9 and P3-16, and the Angel Peak Recreation Area between MP P3-14 and P3-18. An intake pumping plant and four intermediate pump stations would be required to transport the approximately 16,000 to 18,000 ac-ft/yr of water (starting in 1990) required for NMGS Units 1 and 2. This pipeline would operate by gravity from the summit, at about MP P3-32.0, to the terminal storage reservoir. As with the proposed main water pipeline, a second main water pipeline (running parallel and adjacent to the initial pipeline) would be constructed at a later date (tentative 1995 completion date) for NMGS Units 3 and 4. Incremental increases in the amount of water to be transported by the second pipeline would be the same as for the proposed main water pipeline.

Water Storage Reservoir

Proposed Action. The water storage reservoir (R1) would compensate for minor differences between the plant water demand and deliveries from the water supply system during normal plant operations. It would also provide a backup supply for the power plant during scheduled and unscheduled interruptions of service from the water supply system. The proposed reservoir would be located about 2 miles south of NMGS, in the northeastern part of Sec. 36, T23N, R13W, as indicated on Map 1-3.

Alternative. An alternative reservoir site (R2) is located in Sec. 6, T22N, R12W, approximately 1 mile southeast from the proposed site. This location is considered a reasonable alternative if the proposed site is found unsatisfactory after detailed investigations required for design and evaluation.

TRANSMISSION SYSTEM

Transmission Lines

Transmission capacity for the first unit would be provided by a 5-mile 500-kV loop (T5). The two proposed 500-kV lines comprising the loop would be constructed in parallel within a half-mile corridor. This route would be approximately 5 miles long and would be corridorized with the new route of NM 371.

Four possible route alternatives are considered technically and economically feasible for construction of the rest of the 500-kV transmission system (see Map 1-2). These alternatives have been selected to avoid areas of known land use conflicts and to consider reasonable routes of access between NMGS and the proposed Rio Puerco Station. Route T2 is proposed for construction of the first 500-kV transmission line. Route T1 is proposed for the second line from NMGS to Rio Puerco Station. Routes T3 and T4 are the two alternative 500-kV transmission line routes from NMGS to Rio Puerco Station. The proposed and alternative transmission line system is summarized in Table 1-4 (refer to the Project Description Technical Report for more detail).

Rio Puerco Station

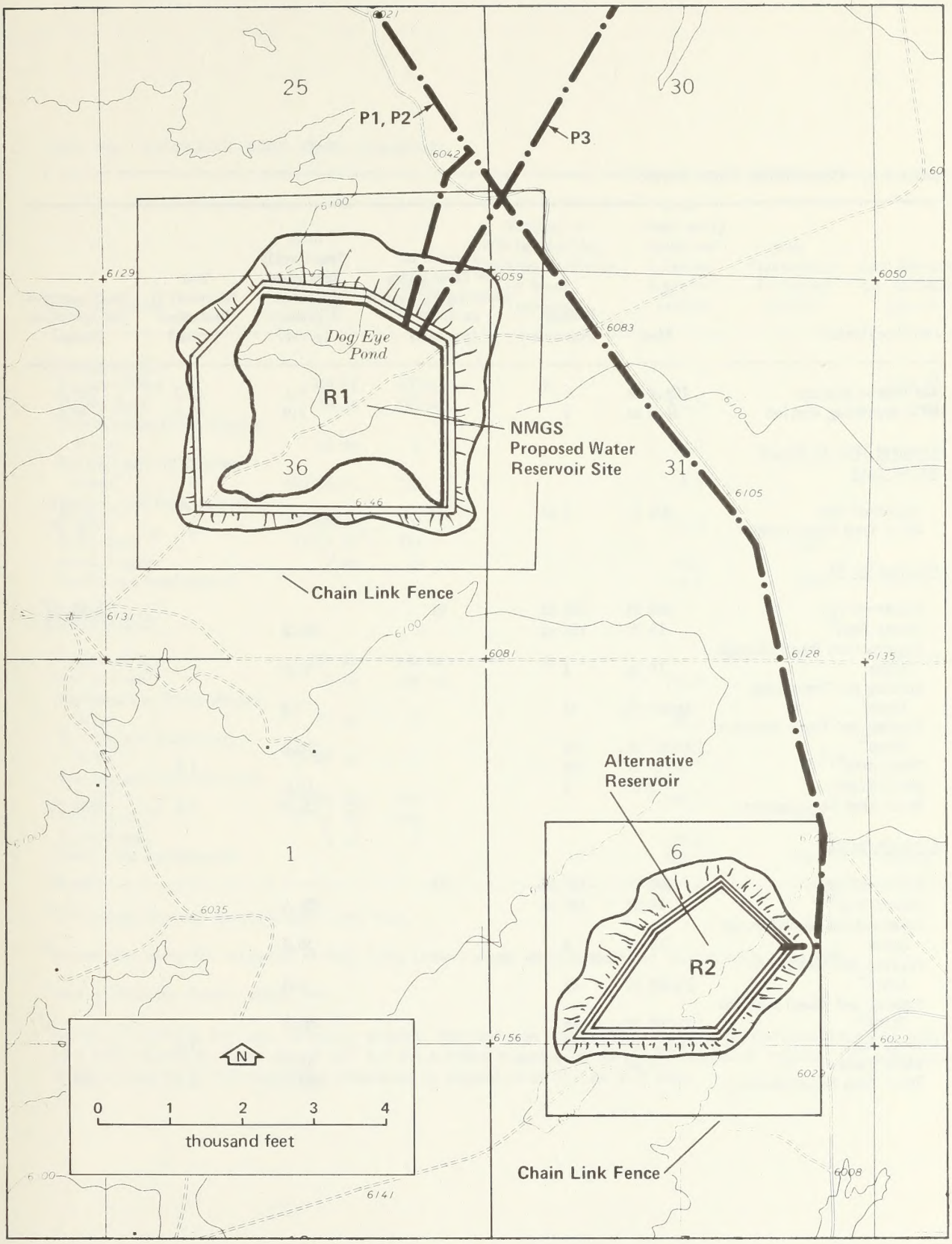
In order to integrate the proposed transmission lines into the existing New Mexico extra-high voltage (EHV) system, PNM proposes to develop a new 500/345-kV transformer, switching, and distribution station in the Albuquerque area, to be called the Rio Puerco Station. The proposed Rio Puerco Station (approximately 10 miles northwest of Rio Rancho, New Mexico) would provide the southern terminus of the 500-kV transmission line system.

Land Requirements

The land requirements for construction and operation of the proposed and alternative 500-kV lines and associated stations are shown in Table 1-4. Land status for the proposed and alternative lines is detailed on the maps in Appendix G.

Structures and Towers

Proposed Action. Three general types of tower structures would be used for the proposed 500-kV transmission lines: tangent (guyed vee tower), angle and dead end (self-supporting lattice steel) (Figure 1-3). Towers would be located to avoid archaeological sites and other environmentally



Source: BLM 1982.

Map 1-3. PROPOSED TERMINAL STORAGE RESERVOIR

Table 1-4. TRANSMISSION SYSTEM SUMMARY

Area/Facilities	Size	Number/ Distance	Portion of ROW Paralleling Existing Utilities or Roads (percent)	Area Temporarily Disturbed (cleared & graded) (acres)	Area Permanently Disturbed (acres)	Land Required for Operation (acres)
Rio Puerco Station	109.2 ac	1		7.1	45.7	109.2
NMGS Switching Station	37.9 ac	1		7.0	40.3	40.3
Proposed NMGS to FC-A-P 500-kV Loop						
Rights-of-Way	200 ft	5 mi	100			121.2[a]
Total Land Requirements					<1	121.2[a]
Alternative T2						
Rights-of-Way	200 ft	101 mi	91			2448.24[a]
Access Road[b]	14 ft	101 mi		200.2		
Construction Route Storage Areas	10 ac	3		30.0		
Pulling and Tensioning Areas[c]	50x200 ft	34		7.8		
Framing and Tower Erection Sites[c]	150x200 ft	404		278.8		
Tower Area[c,d]	177.7 ft^2	404			1.6	
Batch Plants	2 ac	5		10.0		
Total Land Requirements				526.8	1.6	2448.24
Alternative T1						
Rights-of-Way	200 ft	107 mi	32			2593.7[a]
Access Road[b]	14 ft	107 mi		206.4		
Construction Route Storage Areas	10 ac	3		30.0		
Pulling and Tensioning Areas[c]	50x200 ft	36		8.3		
Framing and Tower Erection Sites[c]	150x200 ft	428		295.3		
Tower Area[c,d]	177.7 ft^2	428			1.7	
Batch Plants	2 ac	5		10.0		
Total Land Requirements				550.0	1.7	2593.7

Table 1-4. TRANSMISSION SYSTEM SUMMARY (concluded)

Area/Facilities	Size	Number/ Distance	Portion of ROW Paralleling Existing Utilities or Roads (percent)	Area Temporarily Disturbed (cleared & graded) (acres)	Area Permanently Disturbed (acres)	Land Required for Operation (acres)
Alternative T3						
Rights-of-Way	200 ft	105 mi	36			2545.2[a]
Access Road	14 ft	105 mi		202.5		
Construction Route Storage Areas	10 ac	3		30.0		
Pulling and Tensioning Areas[c]	50x200 ft	35		8.0		
Framing and Tower Erection Sites[c]	150x200 ft	420		289.8		
Tower Area[c,d]	177.7 ft^2	420			1.68	
Batch Plants	2 ac	5		10.0		
Total Land Requirements				540.3	1.68	2545.2
Alternative T4						
Rights-of-Way	200 ft	126 mi	70			3054.2[a]
Access Road[b]	14 ft	126 mi		243.0		
Construction Route Storage Areas	10 ac	3		30.0		
Pulling and Tensioning Areas[c]	50x200 ft	42		9.7		
Framing and Tower Erection Sites[c]	150x200 ft	504		348.0		
Tower Area[c,d]	177.7 ft^2	504			2.0	
Batch Plants	2 ac	5		10.0		
Total Land Requirements				640.7	2.0	3054.2

[a] ROW acreage does not preclude other land uses.

[b] Access road along ROW estimated at 6000 ft/mi (access roads would probably be located within the ROW).

[c] Area or facility located within ROW.

[d] Because of existing land use, primarily grazing, the land area that would be occupied by the guyed towers is based on a 2-foot-diameter circle around each guy and a 5-foot-diameter circle around the center support. The tower area of the estimated 55 self-supporting structures is assumed to be 35 feet x 35 feet.

sensitive areas (such as riparian vegetation, raptor nest sites, or unique habitat identified through BLM survey procedures); span lengths would be adjusted to avoid these areas where practical. Placement of structures within floodplains would be minimized to the fullest extent possible, and in most areas it would be possible to span the floodplain.

Alternative. In addition to the structures described above, an alternative guyed steel structure is being evaluated for use for the NMGS-to-Rio Puerco 500-kV transmission system (Figure 1-3). If selected, guyed delta steel structures would be used for tangent applications only, and then only in areas of nonconflicting land use. Other structure alternatives to be evaluated are self-supporting lattice steel, tubular-steel H-frame, and tubular-steel delta H-frame (Figure 1-4).

WORK FORCE AND SCHEDULE

The applicant estimates that a 14-year period (1985-1998) would be required for site preparation and construction of NMGS Units 1 through 4. Approximately 12 months would be required for construction of the first proposed transmission line and 13 months would be required for construction of the second proposed transmission line. Construction of each intake structure, water pipeline, pumping plants, and storage reservoir would be completed over a 2-year period.

Construction and operation labor requirements for the station facilities, water supply system, and transmission system are shown in Table 1-5. The applicant estimates that 20 to 60 percent of all construction workers at the station site would be in-migrants, depending on local availability of qualified craftsmen. The number of workers enlisted from the local labor force for the water supply system and transmission system is also dependent on local availability at the time of construction.

APPLICANT-COMMITTED PRACTICES

The applicant would undertake a number of design, construction, and restoration practices in addition to those already mentioned. The resource considerations outlined below are intended to reduce environmental impacts. The applicant would be required to incorporate these practices into the Plan of Operations, which encompasses the construction through termination phases of the proposed project.

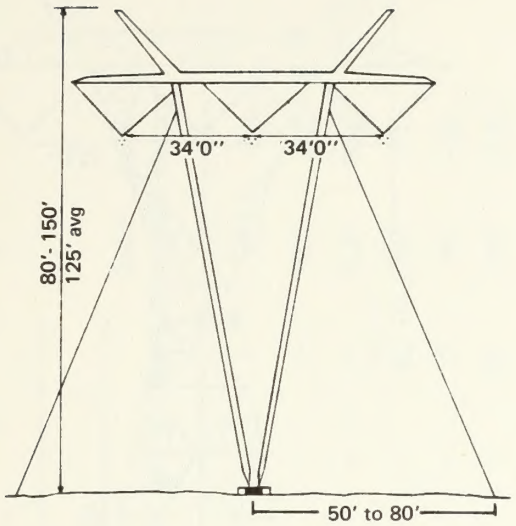
Geology

Spontaneous Combustion of Coal. In order to reduce the likelihood of spontaneous combustion of freshly exposed coal, the applicant would cover freshly exposed coal with clayey soil as soon as possible following completion of the excavation. At the plant site, the applicant would entirely remove the coal, where feasible.

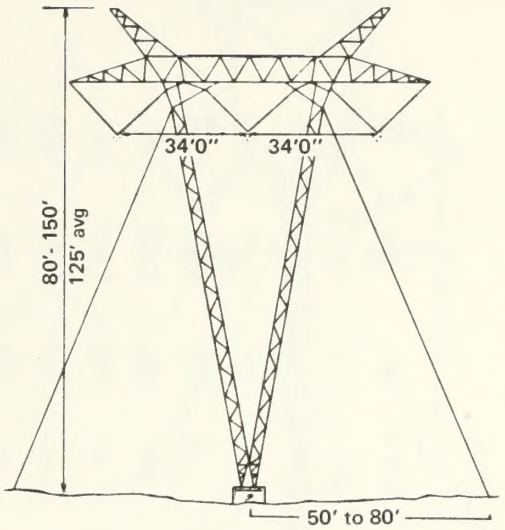
The applicant would locate preexisting coal fires to reduce this potential hazard to construction workers and to project components underlain by coal beds. The applicant would avoid identified active coal fires when possible. If an active coal fire area cannot be avoided, the applicant would remove the burning coal.

Accelerated Erosion. To avoid accelerated erosion of slopes, the applicant would avoid use of tunnels and shafts and would excavate trenches directly down steep slopes rather than across them. Where appropriate, the applicant would install interceptor drains upslope from freshly excavated surfaces. Disturbed areas would be replanted.

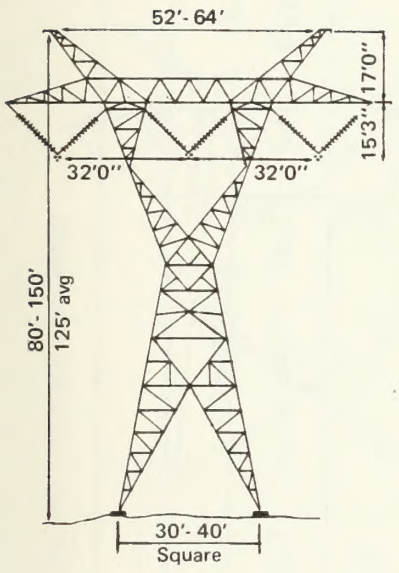
Landslides. The applicant would avoid landslide hazards by careful planning of routing, construction techniques, and project component placement. Installation of pipelines in tunnels and shafts, and laying back the slope to a stable configuration, would be used where appropriate to avoid landslide hazard. Mitigation of landslide potential along the transmission line routes would be accomplished by placing towers individually determined safe distances back from the edges of buttes or mesas. These distances would be determined on the basis of the thickness and the joint spacing of the cap rock and of the configuration and characteristics of the geologic unit making up the slope below the cap rock. Observation of the size of previous landslide masses in the vicinity would provide a basis for judgment as to what constitutes a safe setback from the edge.



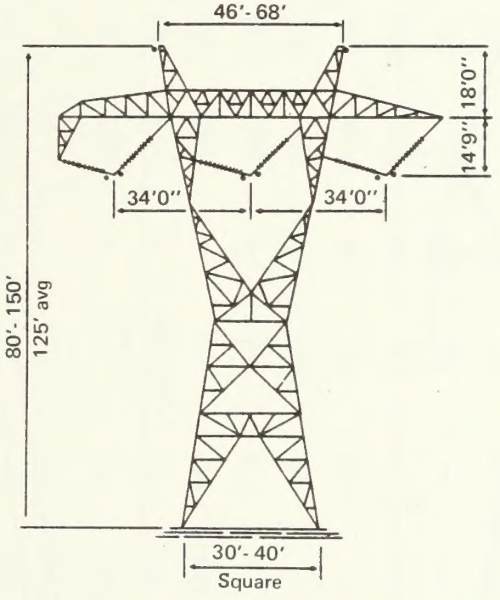
GUYED-VEE TUBULAR-STEEL TOWER



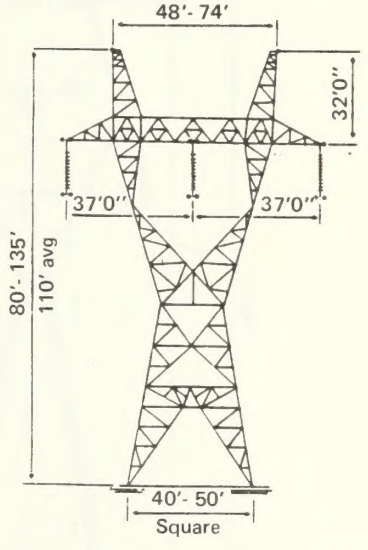
GUYED-VEE LATTICE-STEEL TOWER



SELF-SUPPORTING
LATTICE-STEEL TOWER

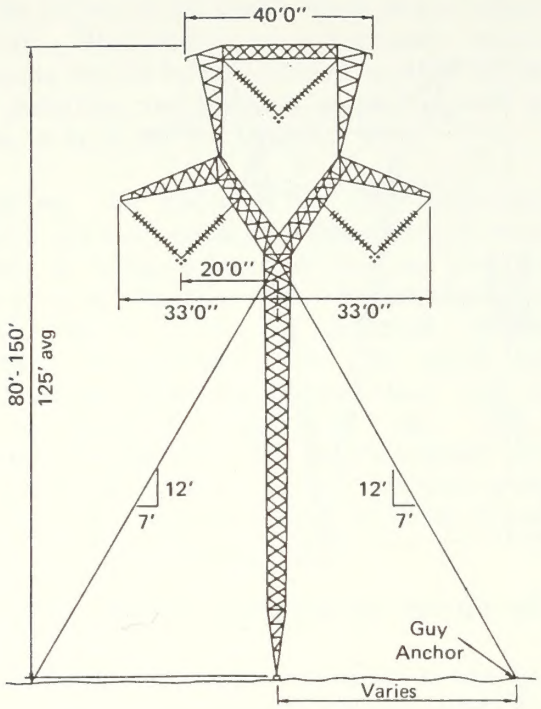


LIGHT-ANGLE
LATTICE-STEEL TOWER

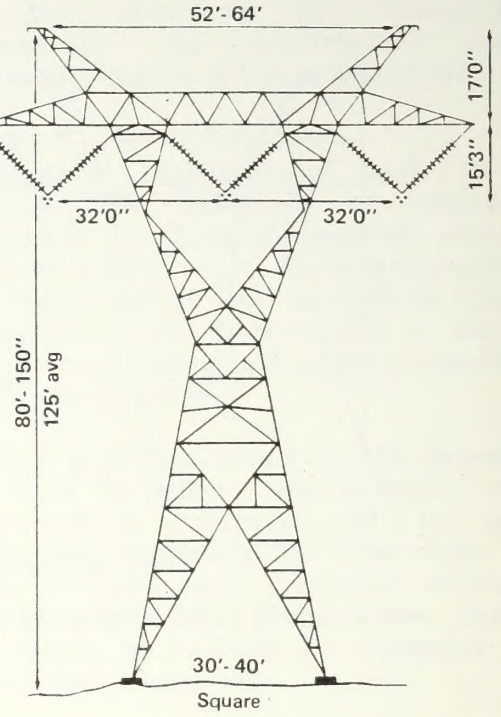


HEAVY-ANGLE LATTICE-STEEL
DEAD-END TOWER

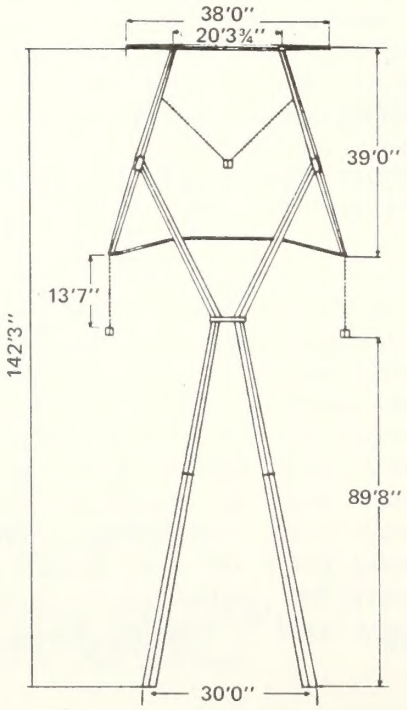
Figure 1-3. 500 kV STRUCTURE TYPES



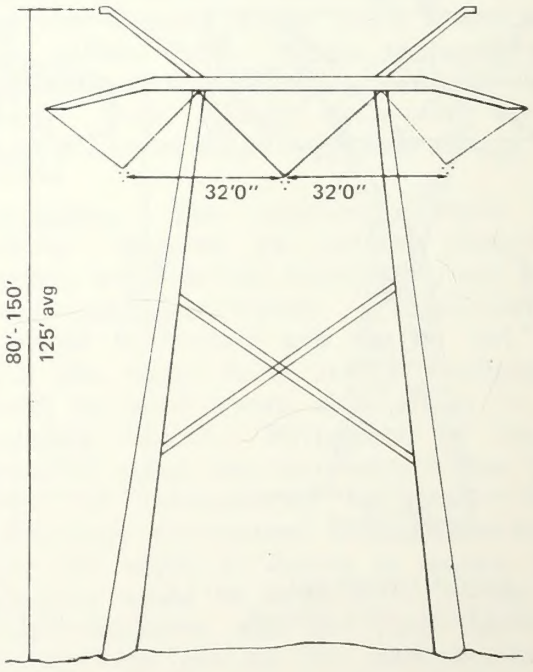
GUYED LATTICE DELTA STEEL STRUCTURE



SELF-SUPPORTING LATTICE STEEL STRUCTURE



DELTA H-FRAME STRUCTURE



TUBULAR STEEL H-FRAME STRUCTURE

Figure 1-4. ALTERNATIVE 500 kV STRUCTURE TYPES

Table 1-5. NMGS CONSTRUCTION AND OPERATION EMPLOYMENT

Year	Intake Pipeline and Reservoir	500-kV Transmission Line	NMGS Construction Unit 1	Unit 2	Unit 3	Unit 4	Total	NMGS Operation Unit 1	Unit 2	Unit 3	Unit 4	Total	Total Employment	Annual Change
1985	—	—	85	—	—	—	85	—	—	—	—	—	85	+85
1986	—	—	800	—	—	—	800	—	—	—	—	—	800	+715
1987	115	—	1515	—	—	—	1630	—	—	—	—	—	1630	+830
1988	295	104	1180	30	—	—	1505	—	—	—	—	—	1505	-125
1989	—	—	360	450	—	—	914	30	—	—	—	30	944	-560
1990	—	—	100	940	40	—	1080	200	—	—	—	200	1280	+336
1991	—	—	—	750	570	—	1320	250	—	—	—	250	1570	+290
1992	—	—	—	270	1260	—	1530	250	24	—	—	274	1804	+234
1993	—	—	—	105	955	30	1090	250	160	—	—	410	1500	-304
1994	—	78	—	—	325	435	838	250	200	30	—	480	1318	-182
1995	—	—	—	—	90	940	1030	250	200	200	—	650	1680	+362
1996	—	—	—	—	—	775	775	250	200	250	—	700	1475	-205
1997	—	—	—	—	—	255	255	250	200	250	24	724	979	-496
1998	—	—	—	—	—	95	95	250	200	250	160	860	955	-24
1999	—	—	—	—	—	—	0	250	200	250	200	900	900	-55

Source: 1980 PNM data.

Soluble Soils. Coarsely crystalline gypsum with a relatively high potential for dissolving tends to be confined to a strongly weathered or decomposed shale adjacent to the ground surface. The applicant would avoid such soils by removing these soils prior to construction or by extending the structure foundations entirely through them. Mitigation by chemical treatment or grouting following construction can be successful, but would be reserved for contingency use in case problems develop despite implementation of the above approaches.

Expansive Soils. Problems caused by expansive soils typically are the result of shrinking and swelling due to changes in moisture content. To mitigate the potential for such problems, the applicant would maintain a constant level of moisture, extend the foundation below the zone of seasonal moisture change, or use lime to chemically treat swelling clay to inhibit expansion. Where possible, the applicant would over-excavate the expansive soil, replacing it with an engineered fill prior to construction.

Collapsing Soils. In order to mitigate the effect of collapsing soils, the applicant would consolidate collapsing soils by erecting a dike and flooding the surface within the dike perimeter. Depending upon the thickness of the zone of collapsible soil, the applicant would extend the structure foundations to a noncollapsible material having an adequate bearing capacity. Other mitigation methods that would be used by the applicant where appropriate include repeatedly dropping heavy weights on the construction area or use of compaction grouting. The most appropriate approach for any given site would be determined by a geotechnical engineer, following subsurface investigations and laboratory testing.

Piping. The surface soils at the reservoir sites would be tested by the applicant to ascertain whether a potential for piping exists. If such a potential does prove to exist and it is not feasible to remove the unsuitable soils, the reservoir would be lined.

Mine Subsidence. If it is possible to enter the mine, the applicant would construct a bulkhead at either end of the portion of the mine that is to be filled. Other methods the applicant would use to reduce the likelihood of ground surface subsidence over a mined area is to backfill the mine, when feasible. This would be accomplished by injecting a slurry of portland cement and pulverized fuel ash or fly ash under high pressure.

Potentially Active Faults. The applicant would avoid known active fault traces. In the case of linear structures, such as transmission lines, tower footings would be kept off fault traces and sufficient slack would be allowed in the section of weirs above the fault so that anticipated movement could be accommodated.

If the likelihood of ground rupture is low (but not nil), a degree of protection would be afforded by providing a thick (perhaps 5-foot) blanket of sand across the site prior to erecting the structure. The objective of this approach is to allow shearing to occur in the sand while limiting the likelihood of shearing in the building. This approach would not be attempted without the advice of a structural engineer having extensive experience with earthquake effects and seismic design. Application of this approach would also require a knowledge of the type and amount of fault displacement that might occur. A site-specific fault investigation would be undertaken where necessary for siting facilities, particularly for the proposed Rio Puerco Station.

Seismically Induced Ground Failure. The potential for liquefaction of saturated granular sediments is commonly ascertained by means of standard penetration tests in the field and grain size analyses in the laboratory, followed by comparison of the results with correlation charts for the expected earthquake acceleration. If liquefaction appears possible, the applicant would undertake, as appropriate, avoidance; densification of the foil by grouting, vibroflotation, or compaction; or extending foundations to a good bearing layer. Choice of the appropriate option would be based upon both site-specific subsurface data and project economics. Landsliding is another common form of seismically induced ground failure. The mitigation methods for seismically induced landslides are the same as those for gravity-induced landslides.

Strong Ground Shaking. The applicant would use appropriate structural designs to mitigate the potential adverse effects of strong ground shaking. For some structures the applicant would perform a dynamic analysis to determine the potential for a hazard. Transmission towers would not only be designed to be sufficiently strong and flexible to withstand the vibrations but would be anchored so as not to topple.

Paleontology

The applicant would avoid where prudent and feasible those areas where paleontological resources of exceptional scientific value have been identified. If avoidance is not prudent or feasible, data recovery (i.e., scientifically controlled excavation, analysis, and curation) of the affected resources would be undertaken. Such a recovery program would be developed for areas classified as being of high to moderate paleontological sensitivity within the proposed project areas (Map 3-1) and would continue up to 2 years, as necessary.

Soils

The applicant would protect soil resources where appropriate by mulching denuded areas or covering with jute fabric or riprap, topsoiling, using drainage control (e.g., water bars) measures, and reseeding.

Vegetation

The applicant would minimize the area of vegetation removed and disturbed during construction activities. Topsoil would be stockpiled for use in revegetation where such soils exist and where only short-term construction will take place. The applicant would conduct surveys in areas of potential habitat for special status plants indicated to be most likely affected by the project. The applicant would revegetate disturbed areas within ROWs with vegetation recommended by the authorized officer. Trees used as nesting sites would be allowed to stand if removal is not essential to component construction. This would allow raptors to return to historical nest sites after construction disturbances are terminated.

Cultural Resources

Prior to initiating any ground disturbance, the applicant would take all required actions to locate and protect cultural resources in accordance with the inventory plan to be developed by the BLM in consultation with the New Mexico State Historic Preservation Officer. This inventory plan would include provisions for a 100 percent BLM Class III Inventory in those areas that would be directly disturbed by project activities. Areas to be inventoried would be determined after engineering surveys have been completed along selected route alternatives. Other topics covered in the plan would be agreements for the evaluation of resources in terms of their eligibility for listing on the National Register of Historic Places, avoidance of significant resources by redesign or realignment of facilities, and implementation of an approved mitigation plan for the protection of significant resources that cannot be prudently and feasibly avoided.

Visual Resources

The applicant would reduce or eliminate certain significant visual consequences that have been identified for the NMGS and transmission lines. General mitigating actions that would be undertaken include architectural or design changes to physical structures, resiting of components, and landscaping techniques.

The applicant would reduce the extent of visual contrast in form and line of plant components by painting (or leaving concrete unpainted) the stacks, storage tanks, boiler and generator housing, and other massive or vertical structures two or more colors, in a banded manner, to blend with the horizontal layering of colors in the natural setting. Transmission line lattice steel towers would be finished to match the surrounding landscape in visually sensitive areas. The paint color sandstone brown, in a matte finish, would be used for blending with the neutral, light colors of most of the semiarid landscape traversed by the transmission line alternatives. The exception to this is the portion of the T4 alternative (approximately MP 65 to 100) where the study area traverses the San Mateo Mesa and Cibola National Forest. A flat forest green color would be used here. Other towers in nonsensitive areas would be finished with "Galva prime" matte finish to prevent the reflection of sunlight.

Waste receptacles would be provided at entry and exit points and in parking lots, and an active waste cleanup program would be maintained both on the plant grounds and along major access roads to the site.

Recreation

The applicant would assist in controlling impacts to the nearby WSAs (De-na-zin, Bisti, and As-shi-sle-pah) through an active employee information program. The focus of the program would be on building an awareness of the outstanding qualities that these resource areas offer when used with respect. Periodic slide presentations would be arranged in cooperation with the BLM for employees and families to explain the value of the resources and to encourage protection by the new neighbors. Display cases would be established at the plant headquarters to reinforce the historic value of the resources in the area. Active gathering of fossils and artifacts would be discouraged, and known violators would be reprimanded by company supervisors and management.

The applicant would provide employees with information on the range of camping and picnic sites available within a 100-mile radius of the plant site. The company would provide, through the Public Information Officer, information on visitation and occupancy at key resource areas (Navajo Lake, Angel Peak, Chaco Culture National Historical Park, etc.) on a periodic basis (every 2 weeks during peak season) so that employees can be advised to visit less-crowded areas.

An active employee information program would be initiated to discourage misuse of off-road vehicles (ORVs) in the study region and to warn employees that violators would be reprimanded. Protected and fragile areas (e.g., the Bisti WSA) would be identified, as well as pathways and undeveloped roads approved for ORV use.

To protect wilderness values, the applicant would provide information to employees and contractors regarding the fragile nature of wilderness areas and visitors' responsibilities. The applicant would identify other recreation resources within a 5-hour travel distance.

Transportation

To reduce the number of commute vehicles associated with NMGS, the applicant would actively encourage company personnel and contractors to share rides or use private contractor commute buses. The applicant would initiate an origin-destination commute file for company personnel and provide assistance in arranging ride-share programs for employees.

Social and Economic Conditions

The availability of housing and human services would be reassessed by the applicant 12 months prior to project startup. Appropriate mitigation measures would be determined at that time, if necessary. Mitigation options that PNM might consider include:

- Provision of a construction worker camp
- Mortgage interest rate subsidies to NMGS employees
- Company-sponsored development of mobile home park space for employees
- Company counselors and social workers
- Community service agency liaison

Native American Values and Lifestyles

The applicant would attempt to enhance any potential opportunities to improve local facilities and services utilized by Native Americans (e.g., water supply, access roads) whenever possible. The applicant would undertake recruitment and training programs to ensure that Native Americans have an opportunity to gain from potential employment benefits of the project.

NO-ACTION ALTERNATIVE

The purpose of the analysis of the no-action alternative is to provide a benchmark, enabling decision makers to compare the magnitude of environmental effects of the Proposed Action and alternatives. For the purpose of this EIS, the no-action alternative is defined as the NMGS not being constructed and operated.

If the no-action alternative is selected and there is a need for electricity that PNM must meet, PNM would need to consider alternative means of providing for the need

for baseload power in a manner different from NMGS.

The analysis of the no-action alternative therefore considered reasonably predictable consequences of not building NMGS. Based on a screening process, several alternatives were retained for consideration as reasonably predictable consequences of no action (Table 1-6). The analysis of other power sources or need reduction alternatives is detailed in the technical report on Alternatives to the Project. Another possible consequence of this alternative is that a site different from the Bisti site would need to be proposed by PNM.

DELAY-OF-ACTION ALTERNATIVE

The delay-of-action alternative is defined as a delay of one or more years. The delay could be in the start of construction of Unit 1 or in the time of beginning of construction of Units 2, 3, and 4. Figure 1-5 gives a comparison of total employment for the delay-of-action compared with the Proposed Action, and shows that the project could be completed as late as 2011.

SUMMARY OF IMPACTS FOR ALTERNATIVES

Tables 1-7, 1-8, and 1-9 present a summary of the impacts that would be expected for each alternative. Information presented in this section comprises a summary of impacts in a comparative form, which is based on the analysis in Chapter 3. Impacts described in Tables 1-7 and 1-8, and 1-9 include those identified as significant and others that are not considered important by the public or that provide meaningful information for the comparison of alternatives. Other, less important, impacts are discussed in Chapter 3 and in the technical reports. Information presented in this section is limited to a descriptive summary of impacts in a comparative form, which is based on the analysis in Chapter 3.

AGENCY'S PREFERRED ALTERNATIVES

NMGS alternatives are summarized in Table S-1. The BLM New Mexico State Director has the authority to issue all land use grants, permits, and amendments for public lands in New Mexico. Use of these grants and permits would be contingent on the applicant's receipt of approximately 30 other necessary permits and approvals for NMGS (see Authorizing Actions). Selection of plant system alternatives would be made during these other permitting processes. For example, selection of Best Available Control Technology for air quality would be made during the PSD (Prevention of Significant Deterioration) application process; and approval of the ultimate water supply system rests with the New Mexico State Engineer (and may include the Interstate Stream Commission, the Bureau of Reclamation, and the Secretary of the Interior).

BLM's primary responsibility for this proposal would involve whether to approve the Ute Mountain Land Exchange and whether to issue ROW grants for transmission and pipelines associated with the NMGS. Based on impact analysis, BLM has selected preferred alternatives as follows:

Ute Mountain Land Exchange

The Ute Mountain Land Exchange (UMLE) was the subject of an EA (BLM 1981) ((see Appendix J) in which Paragon Resources, Inc., proposes to exchange approximately 17,138 acres of private lands in Taos County, New Mexico (Ute Mountain) for approximately 8000 acres of public land in the San Juan Basin (Bisti lands). This document completes the NEPA compliance for the exchange proposal. In a BLM planning decision (Rio Grande MFP), BLM decided it would "attempt to acquire Ute Mountain...for its unique natural values and the buffer area it provides for the Rio Grande Wild and Scenic River." The reason for wanting to acquire this land is to "...provide for better protection and management of the Wild and Scenic River."

The Ute Mountain Land Exchange EA addresses the environmental impacts of the proposed exchange and the NMGS EIS addresses alternatives to the exchange both for the Bisti lands and Ute Mountain, in addition to the proposed and possible end uses of the Bisti lands. These two documents provide NEPA coverage for the proposed exchange.

Table 1-6. NO-ACTION ALTERNATIVES

Coal conversion plant	A coal gasification facility in conjunction with either a combined-cycle or fuel-cell generating plant. This would probably not be commercially available until the mid-1990s.
Decentralized coal-fired steam electric system	Two or more small coal-fired plants with the same combined capacity as NMGS, built at two or more locations.
Geothermal plant	A generating plant using steam from underground high-temperature (>150°C) hot water reservoirs.
Nuclear plant	A light-water fission reactor plant. Operation of such a plant could probably not commence until the mid-1990s.
Out-of-state power source	This alternative would rely on either contract purchase of out-of-state power or equity participation in one or more out-of-state generation projects.
Renewable resource alternatives	This is a combination strategy involving a variety of renewable generation resources, possibly including large and small hydroelectric, central-station solar-thermal electric and photovoltaic, decentralized photovoltaic, municipal solid waste, central-station wind, agricultural and forestry wastes, and wood-fired generation. Energy storage might be required with this alternative.
Other sites	Other sites potentially capable of supporting a 2000-MW coal-fired steam electric generating station may have to be considered.
Alternative use of San Juan Basin coal	The coal may either be used locally within the basin for another proposed facility, such as a coal gasification plant, or exported for use outside the basin.

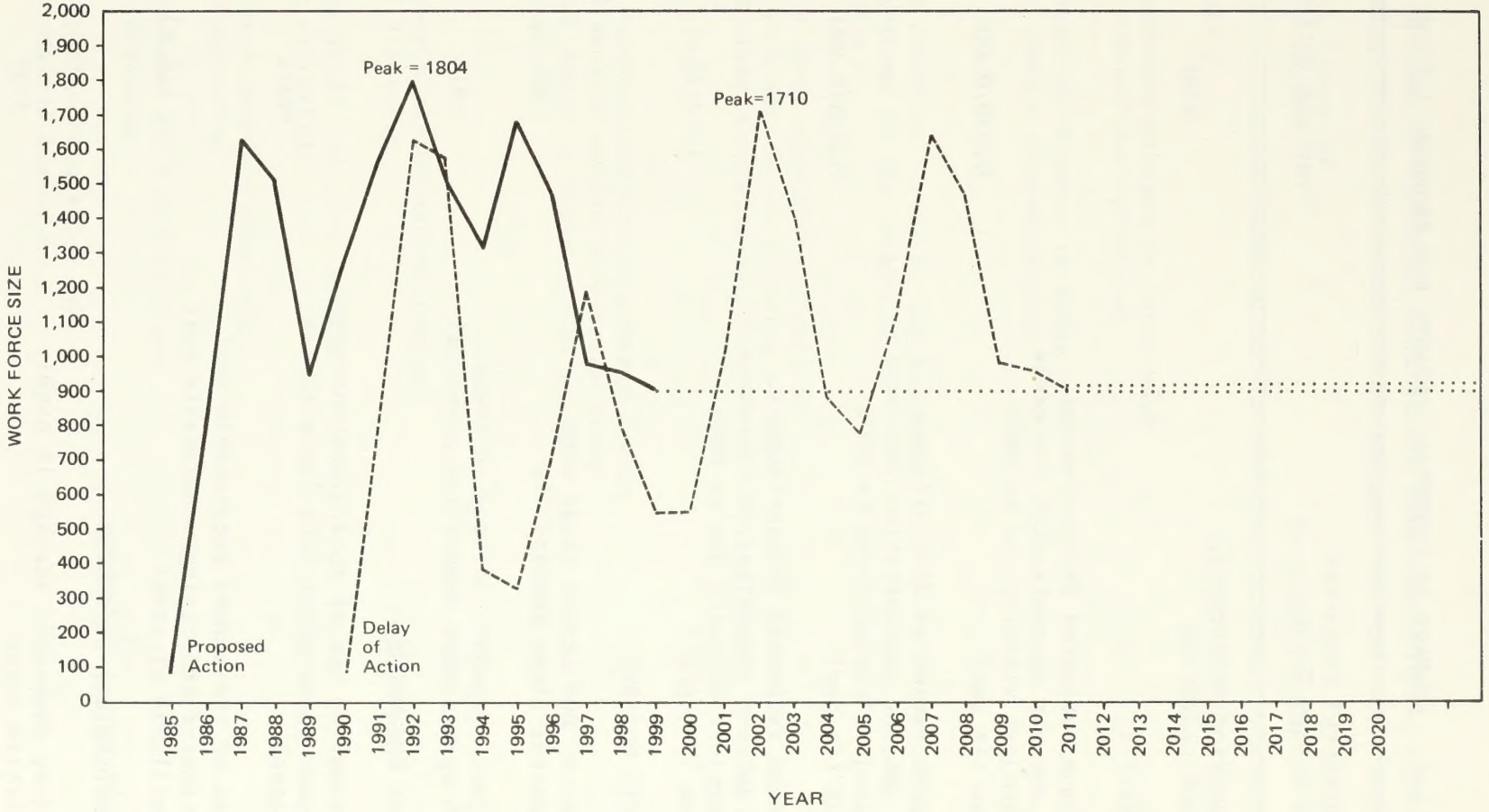


Figure 1-5. COMPARISON OF TOTAL EMPLOYMENT, PROPOSED ACTION AND DELAY OF ACTION, 1985 -2020

Table 1-7. SUMMARY OF POTENTIAL IMPACTS FOR PROPOSED ACTION

Environmental Resources and Impact Topics	Proposed Action[a]
CONSTRUCTION/OPERATIONAL ACREAGE DISTURBED	8786[b]
AIR QUALITY	
Maximum estimated 24-hour/annual SO_2 ambient concentration increases in project vicinity due to NMGS alone (in ppm)	0.029/0.002
Maximum estimated 24-hour/annual NO_2 ambient concentration increases in project vicinity due to NMGS alone (in ppm)	0.054/0.003
Maximum estimated 24-hour/annual TSP ambient concentration increases in project vicinity due to NMGS alone (in g/m^3)	13-27/3-5
GEOLOGIC HAZARDS	
Miles of ROW across areas with potential slope instability	38
Project component acreage in areas with spontaneous combustion potential	2813
MINERAL RESOURCES	
Consumptive use of coal/limestone over 40-year power plant life (in millions of tons)	300/4
Miles of ROW across recoverable coal (estimated underlying recoverable coal in millions of tons)	17.5 (18.8)
PALEONTOLOGICAL RESOURCES	
Project component acreage in highly sensitive areas	3707
Project component acreage in moderately sensitive areas	2252

Table 1-7. SUMMARY OF POTENTIAL IMPACTS FOR PROPOSED ACTION (continued)

Environmental Resources and Impact Topics	Proposed Action[a]
SOILS RESOURCE	
Project component acreage in areas with high wind erosion susceptibility	5126
Project component acreage in areas with high water erosion susceptibility	1532
HYDROLOGY	
Streamflow reduction (cfs) in the San Juan River downstream of the intake on an average basis	48
Increase in flood elevations (feet) in the San Juan River in the vicinity of the intake and river diversion facility	>1
WATER QUALITY	
Estimated maximum increase in average levels of total dissolved solids downstream along the Colorado River at Imperial Dam in mg/l (percent increase)	4(0.39)
VEGETATION	
Acres of sand wash and saline lowland vegetation disturbed	702
Acres of badlands and steep slopes vegetation disturbed	323
Acres of shrublands and grasslands vegetation disturbed	7037
Acres of juniper and pinyon-juniper vegetation disturbed	722
Acres of riparian vegetation and irrigated cropland disturbed	2

Table 1-7. SUMMARY OF POTENTIAL IMPACTS FOR PROPOSED ACTION (continued)

Environmental Resources and Impact Topics	Proposed Action[a]
WILDLIFE	
Acres of mule deer crucial winter range that would be disturbed during construction/ removed from production over the life of the project	67/36
Number of raptor nests within 5 miles of project components	51
Number of raptor nests within 1 mile of project components	2
THREATENED AND ENDANGERED SPECIES	
Number of threatened and endangered plant species with potential habitat disturbed	1 Mesa Verde cactus (Sclerocactus mesae verdae)
Number of threatened and endangered plant species potentially affected by acid precipitation	1 Mancos milkvetch (Astragalus humil[illegible]us)
Number of threatened and endangered aquatic species potentially affected by acid precipitation	1 Greenback cutthroat trout (Salmo clarki stomias)
Number of threatened and endangered terrestrial species potentially affected by acid precipitation and human population increase	1 Bald eagle (Halialetus peucocephalus)
VISUAL RESOURCES	
Project component acreage that would exceed contrast ratings for VRM Class II areas	364
Project component acreage that would exceed contrast ratings for VRM Class IV areas	1125
Miles of transmission corridor that could conflict with NPS management goals.	20

Table 1-7. SUMMARY OF POTENTIAL IMPACTS FOR PROPOSED ACTION (continued)

Environmental Resources and Impact Topics	Proposed Action[a]
RECREATION	
Estimated maximum annual increase in fishing demand in user participation days for San Juan and McKinley counties (in 1992)	7183
Estimated maximum annual increase in boating, swimming, and waterskiing demand in user participation days for San Juan and McKinley counties (in 1992)	4176
Estimated maximum annual increase in camping, picnicking, and hiking demand in user participation days for San Juan and McKinley counties (in 1992)	10,208
Estimated maximum annual increase in sight-seeing/visiting historical sites/photography demand in user participation days for San Juan and McKinley counties (in 1992)	4550/1654/4956
TRANSPORTATION	
Estimated increase (above baseline) of vehicles to crosstown traffic in Farmington during peak periods of the day for peak employment years (percent increase in traffic)	650 (10-20)
Estimated increase (above baseline) in vehicles during peak commute periods of the day along N.M. 371 for peak employment years	650
SOCIAL AND ECONOMIC CONDITIONS	
Estimated maximum annual population increase in San Juan County in 1995 (percent increase over baseline projections)	3400 (3.2)
Estimated maximum annual population increase in Farmington in 1995 (percent increase)	1975 (4.4)

Table 1-7. SUMMARY OF POTENTIAL IMPACTS FOR PROPOSED ACTION (concluded)

Environmental Resources and Impact Topics	Proposed Action[a]
SOCIAL AND ECONOMIC CONDITIONS (continued)	
Estimated peak annual increase in demand for housing units in 1995 in the greater Farmington area	1190
Projected maximum annual direct and indirect personal income generated in San Juan and McKinley counties in 1992 (in constant 1980 dollars)	75,671,000
Projected total direct and indirect personal income generated in San Juan and McKinley counties between 1984 and 2000 (in constant 1980 dollars)	782,282,000
Estimated undiscounted cumulative net surplus in municipal operating funds generated between fiscal years 1985 and 2000 (in constant 1980 dollars)	
Farmington	221,000
Aztec	161,000
Bloomfield	132,000
Estimated effects on all San Juan County operating funds between 1985 and 2000 (in constant 1980 dollars)	
1985	-2000
1990	+427,000
1995	+2,060,000
2000	+3,040,000

[a]For the purposes of this table, the Proposed Action includes: NMGS; proposed main water pipeline P1 (including Farmington intake pumping plant and 3 intermediate booster pump stations); proposed reservoir R1; proposed transmission line corridor T1; proposed transmission line corridor T2; proposed NMGS to FC-A-P 500-kV transmission line loop (T5); and Rio Puerco Station.

[b]Other land uses would be precluded on 3192 acres.

Table 1-8. SUMMARY OF POTENTIAL IMPACTS FOR COMPARING ALTERNATIVE WATER SUPPLY SYSTEMS

Environmental Resources and Impact Topics	Water Supply			Water Delivery					Water Storage	
	Proposed-35,000 ac-ft/yr from San Juan River	20,000 ac-ft/yr from San Juan River, 15,000 ac-ft/yr Groundwater	20,000 ac-ft/yr from San Juan River	Proposed-Intake for Water Pipeline P1	Intake for Water Pipelines P2 and P3	Proposed-Water Pipeline P1[a]	Water Pipeline P2[a]	Water Pipeline P3[a]	Proposed-Reservoir R1	Reservoir R2
CONSTRUCTION/OPERATIONAL ACREAGE DISTURBED	NA	NA	NA	35	35	439[b]	473[b]	579[b]	640	320
GEOLOGIC HAZARDS										
Miles of ROW across areas with potential slope instability	NA	NA	NA	NA	NA	1	5	2	NA	NA
Miles of ROW across areas with spontaneous combustion potential	NA	NA	NA	NA	NA	6.7	8.6	8.5	NA	NA
MINERAL RESOURCES										
Miles of ROW across recoverable coal (estimated underlying recoverable coal in millions of tons)	NA	NA	NA	NA	NA	5 (5)	5 (5)	4.5 (4.5)	NA	NA
PALEONTOLOGICAL RESOURCES										
Miles of ROW across highly sensitive areas	NA	NA	NA	NA	NA	2	2	13	NA	NA
Miles of ROW across moderately sensitive areas	NA	NA	NA	NA	NA	37.7	40.6	35.5	NA	NA
SOILS RESOURCE										
Miles of ROW across soils with high wind erosion susceptibility	NA	NA	NA	NA	NA	31.7	28.4	34	NA	NA
Miles of ROW across soils with high water erosion susceptibility	NA	NA	NA	NA	NA	1.6	2.6	3.6	NA	NA
Acres of soils which are highly susceptible to wind erosion	NA	NA	NA	0	0	346	310	371	35	0
Acres of soils which are highly susceptible to water erosion	NA	NA	NA	0	0	17	28	39	0	4
HYDROLOGY										
Steamflow reduction (cfs) in the San Juan River downstream of the intake on an average basis	48	28	28	NA	NA	NA	NA	NA	NA	NA

Table 1-8. SUMMARY OF POTENTIAL IMPACTS FOR COMPARING ALTERNATIVE WATER SUPPLY SYSTEMS (continued)

Environmental Resources and Impact Topics	Water Supply			Water Delivery					Water Storage	
	Proposed-35,000 ac-ft/yr from San Juan River	20,000 ac-ft/yr from San Juan River, 15,000 ac-ft/yr Groundwater	20,000 ac-ft/yr from San Juan River	Proposed-Intake for Water Pipeline P1	Intake for Water Pipelines P2 and P3	Proposed-Water Pipeline P1[a]	Water Pipeline P2[a]	Water Pipeline P3[a]	Proposed-Reservoir R1	Reservoir R2
HYDROLOGY (concluded)										
Drawdown (in feet) which would occur to groundwater users whose wells tap the Westwater Canyon Member, Dakota Sandstone, and Entrada Sandstone aquifers in the San Juan structural basin	NA	> 25	NA	NA	NA	NA	NA	NA	NA	NA
Potential for increases in flood elevation	NA	NA	NA	Lower potential than for P_2 and P_3 intake	Higher potential than for P_1 intake	NA	NA	NA	NA	NA
WATER QUALITY										
Estimated maximum increase in average levels of total dissolved solids downstream along the Colorado River at Imperial Dam in mg/l (percent increase)	4 (0.39)	2.3 (0.22)	2.3 (0.22)	NA	NA	NA	NA	NA	NA	NA
Short-term increases in turbidity levels immediately downstream from intake construction activities (yes or no)	NA	NA	NA	Yes	Yes	NA	NA	NA	NA	NA
VEGETATION										
Acres of sand wash and saline lowland vegetation disturbed	NA	NA	NA	2	0	4	49	4	27	12
Acres of badlands and steep slopes vegetation disturbed	NA	NA	NA	0	0	44	44	44	51	16
Acres of shrublands and grasslands vegetation disturbed	NA	NA	NA	31	5	350	276	381	562	292
Acres of juniper and pinyon-juniper vegetation disturbed	NA	NA	NA	0	0	41	6	107	0	0
Acres of riparion vegetation and irrigated cropland disturbed	NA	NA	NA	2	30	0	98	3	0	0
WILDLIFE										
Miles of ROW across mule deer crucial winter range	NA	NA	NA	NA	NA	2.8	1	1	NA	NA

Table 1-8. SUMMARY OF POTENTIAL IMPACTS FOR COMPARING ALTERNATIVE WATER SUPPLY SYSTEMS (concluded)

Environmental Resources and Impact Topics	Water Supply			Water Delivery					Water Storage	
	Proposed-35,000 ac-ft/yr from San Juan River	20,000 ac-ft/yr from San Juan River, 15,000 ac-ft/yr Groundwater	20,000 ac-ft/yr from San Juan River	Proposed-Intake for Water Pipeline P1	Intake for Water Pipelines P2 and P3	Proposed-Water Pipeline P1[a]	Water Pipeline P2[a]	Water Pipeline P3[a]	Proposed-Reservoir R1	Reservoir R2
WILDLIFE (concluded)										
Acres of mule deer crucial winter range that would be removed from production over the life of the project	NA	NA	NA	35	35	1	0	0	0	0
THREATENED AND ENDANGERED SPECIES										
Number of threatened and endangered plant species with potential habitat traversed or affected	NA	NA	NA	0	0	1[g]	1[g]	1[g]	0	0
CULTURAL RESOURCES										
Number of presently identified archaeological and/or historic sites within study area[c]	NA	NA	NA	NA	NA	71	79	64	NA	NA
VISUAL RESOURCES										
Percent VRM Class II	NA	NA	NA	0	0	0	0	22	0	0
Percent VRM Class III	NA	NA	NA	100	100	92	92	60	0	0
Percent VRM Class IV	NA	NA	NA	0	0	8	8	18	100	100
SOCIAL AND ECONOMIC CONDITIONS										
Projected tax revenues for year 1 after completion (in dollars)	NA	NA	NA	—[d]	—[e]	502,580	466,061	476,170	—[f]	—[f]

Note: The following resources or considerations were not included in this table, because there is no basis for comparison: Climate, Air Quality, Noise, Recreation, Wilderness, Transportation, and Land Use Controls and Constraints.

NA = Not applicable.

[a]Including booster pump stations; final location of centerline could affect impact findings.

[b]ROW acreage would not preclude other land uses.

[c]Refer to Cultural Resources Technical Report for definitions of study areas.

[d]Included within $502,580 listed for Proposed Water Pipeline P1.

[e]Included within $466,061 and $476,170 listed for water pipelines P2 and P3, respectively.

[f]Included within the overall tax revenues for the proposed generating station.

[g]The species affected would be Sclerocactus mesae verdae.

Table 1-9. SUMMARY OF POTENTIAL IMPACTS FOR COMPARING THE PROPOSED AND ALTERNATIVE TRANSMISSION LINE CORRIDORS

Environmental Resources and Impact Topics	Proposed-Transmission Line T1	Proposed-Transmission Line T2	Proposed-Transmission Line T5	Transmission Line T3	Transmission Line T4
CONSTRUCTION/OPERATIONAL ACREAGE	2594[a]	2448[a]	121[a]	2545[a]	3054[a]
GEOLOGIC HAZARDS					
Miles of ROW across areas with potential slope instability	9	23	5	21	46
Miles of ROW across areas with spontaneous combustion potential	12	1	1	4	4
MINERAL RESOURCES					
Miles of ROW across recoverable coal (estimated underlying recoverable coal in millions of tons)	12.5 (13.8)	0	0	2 (3.6)	Unknown
PALEONTOLOGICAL RESOURCES					
Miles of ROW across highly sensitive areas	50	0	3	0	3
Miles of ROW across moderately sensitive areas	13	35	0	1	0
SOILS RESOURCE					
Miles of ROW across soils with high wind erosion susceptibility	56.6	37.3	5	47	50
Miles of ROW across soils with high water erosion susceptibility	23.5	32	0	22.8	23.3
VEGETATION					
Acres of ponderosa and pinyon pine, oak vegetation disturbed	0	0	0	0	475
Acres of sand wash and saline lowland vegetation disturbed	151	102	0	77	17
Acres of badlands and steep slopes vegetation disturbed	70	14	97	85	80
Acres of shrublands and grasslands vegetation disturbed	1988	2036	24	2068	2101
Acres of juniper and pinyon-juniper vegetation disturbed	385	296	0	315	381
WILDLIFE					
Acres of mule deer crucial winter range that would be disturbed during ROW construction (% of regional resource)	0	0	0	0	291 (<1)
Acres of elk crucial winter range that would be disturbed during ROW construction (% of regional resource)	0	0	0	0	291 (<1)

Table 1-9. SUMMARY OF POTENTIAL IMPACTS FOR COMPARING THE PROPOSED AND ALTERNATIVE TRANSMISSION LINE CORRIDORS (concluded)

Environmental Resources and Impact Topics	Proposed-Transmission Line T1	Proposed-Transmission Line T2	Proposed-Transmission Line T5	Transmission Line T3	Transmission Line T4
WILDLIFE (concluded)					
Number of raptor nests within 5 miles of centerline	14	25	4	11	3
Number of raptor nests within 1 mile of centerline	1	1	0	1	1
THREATENED AND ENDANGERED SPECIES					
Number of threatened and endangered plant species with potential habitat traversed	1 (*Sclerocactus mesae verdae*)	1 (*Sclerocactus mesae verdae*)	1 (*Sclerocactus mesae verdae*)	1 (*Sclerocactus mesae verdae*)	1 (*Sclerocactus mesae verdae*)
CULTURAL RESOURCES					
Number of presently identified archaeological and/or historic site within study areas[b]	73	164	[c]	51	156
VISUAL RESOURCES					
Percent VRM Class II	5	5	0	5	4
Percent VRM Class III	30	43	0	13	30
Percent VRM Class IV	65	52	100	82	66
Miles of ROW that would exceed contrast ratings for VRM Class II areas (number of significantly impacted areas identified)	5 (1)	10 (1)	0 (0)	25 (2)	10 (1)
Miles of ROW that would exceed contrast ratings for VRM Class IV areas (number of significantly impacted areas identified)	20 (2)	0 (0)	0 (0)	5 (1)	5 (1)
SOCIAL AND ECONOMIC CONDITIONS					
Projected tax revenues for year 1 after completion (in 1993 dollars)	700,902	647,306	55,251	712,110	849,397

Note: The following resources or considerations were not included in this table, because there is no basis for comparison: Climate, Air Quality, Noise, Hydrology, Water Quality, Recreation, Wilderness, Transportation, and Land Use Controls and Constraints. The final location of centerlines could affect impact findings.

[a]ROW acreage would not preclude other land uses.

[b]Refer to Cultural Resources Technical Report for definitions of study areas.

[c]Included within number of sites listed for T4.

The BLM desires to acquire Ute Mountain for its recreational and other values; therefore, BLM's preferred alternative is to consummate the Ute Mountain Land Exchange. This action would also make available the lands PNM would receive in the exchange for use as a site for NMGS. Before consummating the exchange, the Department of Interior must resolve that part of the Navajo Tribe's selection under the Navajo-Hopi Relocation Amendments which is in conflict with the exchange.

ROWs for the New Mexico Generating Station

The BLM's second action pertains to PNM applications for water pipelines and transmission ROWs associated with the proposed NMGS. Based on the impact analysis (see DEIS Chapter 3, Tables 1-7, 1-8, and 1-9), BLM has determined that the following route alternative would have the least amount of environmental impact:

- Water pipeline route P1, which includes the proposed intake structure near Farmington and water reservoir site R1. The route for P1 is the shortest distance and would be located within an existing highway ROW for approximately 75 percent of its length.

- Transmission route T5 corridor for the 5-mile connecting loop to the approved FC-A-P line.

- T3 for the second 500-kV transmission line.

- T2 for the third 500-kV transmission line.

Of the four alternatives, T2 and T3 are the shortest in length and follow the greatest number of miles of existing ROWs. In addition, T2 and T3 would cross the least amount of recoverable coal. Rio Puerco Station would be the terminus point for both T2 and T3.

The BLM New Mexico State Director has the authority to issue all land use grants, permits, and amendments for public lands in New Mexico; however, in order to construct the NMGS, approximately 30 other federal and state permits or approvals would be required (see DEIS Appendix F). Based on the impact assessment, these ROWs would be an acceptable use of public lands. However, because of the major role of several state agencies in issuing the necessary permits and approvals for NMGS and because of the uncertainty in the precise timing of NMGS, the BLM's preferred alternative for the ROW grants is to issue these grants for the above-mentioned alternatives once other applicable permits have been obtained by the applicant.

AREAS OF CONTROVERSY

Areas of controversy have been raised by the public and agencies throughout the EIS process. Of the issues raised (see Chapter 4), environmental issues that were within the scope of this EIS are discussed in DEIS Chapter 3. Other areas of controversy include the following:

- Navajo-Hopi Relocation Act - selection of 35,000 acres of public land in northwestern New Mexico which includes the proposed site for NMGS.

- Navajo lawsuit - claiming 2 million acres of land in northwestern New Mexico which includes the proposed site for NMGS.

- Is there a need for power from NMGS?

- Cumulative impacts of the proposed San Juan Basin development to Chaco Culture National Historical Park.

- Availability of a water source of 35,000 acre-feet per year.

- Proximity of the proposed NMGS site to the Bisti and De-na-zin WSAs and Chaco Culture National Historical Park.

- Jicarilla Tribe's lawsuit against the second Amendatory Contract between Utah International Inc. and the United States, involving use of the proposed and alternative water sources.

- Is there a need for development of a new town?

- State Engineer's authority over waters on or beneath Indian lands.

- The National Park Service is not in agreement with BLM's selection of the T2 transmission corridor as its Preferred Alternative. Part of BLM's rationale for selection of T2 (over T1 or T4) is that it is the shortest of the four alternatives and would parallel existing utilities or roads over 91% of its length. T2 would parallel an existing 230 kV transmission line in the area which is not currently visually intrusive and is smaller (40 feet high versus 80 to 150 feet) than the proposed line.

Chapter 2

Chapter 2

AFFECTED ENVIRONMENT

This chapter provides information for the portion of the environment that, based on analysis, would be affected by the Proposed Action or alternatives. The affected environment for the Proposed Action and alternatives was analyzed for the following resources:

- Climate
- Air Quality
- Noise
- Geologic setting (including geologic hazards)
- Mineral resources
- Paleontological resources
- Soils (including prime and unique farmlands)
- Hydrology
- Water quality
- Vegetation
- Wildlife
- Threatened and endangered species
- Cultural resources
- Visual resources
- Recreation resources
- Wilderness values
- Transportation
- Social and economic conditions (including traditional values and lifestyles)

The amount of detail presented for each resource topic is commensurate with the anticipated level of significance of the impact. Thus the affected environment is described in greater detail where significant impacts are expected and in less detail where no significant impacts are expected. Further description of the affected environment, where no significant impacts are expected, is provided in technical background reports.

Baseline data were compiled from existing sources for each resource topic in geographic areas of influence determined by the impact analysis in Chapter 3. These geographic areas of influence for each resource are defined and summarized below for each resource topic. Generally, these areas of influence included:

- The area in the immediate vicinity of the proposed NMGS plant site, water pipelines, transmission lines, and other surface facilities.

- A larger area of influence that extended beyond sites of surface disturbances and construction activities to a distance where impacts could no longer be reasonably identified with the project. For many resources, this larger area of influence extended a considerable distance (e.g., 100 miles for recreation resources) beyond construction sites and designated ROWs.

Resource topics are discussed under headings for the proposed and alternative generating station facilities, water supply system, and transmission system. In accordance with the CEQ regulations, this approach to EIS organization is intended to reduce the size of the EIS by avoiding duplication. Therefore descriptions of the affected environment are not repeated if the environment is similar to that of a project component already discussed.

NEW MEXICO GENERATING STATION

CLIMATE

The climate of the region surrounding the proposed NMGS is characterized as dry, high-altitude continental, with low relative humidity, a high percentage of sunshine, and

a relatively large annual and diurnal temperature range. Mean average annual temperatures range from 43.8°F at Dulce, 90 miles north-northeast of the project site, to 50.5°F at Chaco Culture National Historical Park, 12 miles southwest of the project site. Annual average precipitation ranges from 17 inches at Dulce to less than 8 inches at Chaco Culture National Historical Park. Wind speeds are moderate, although strong winds often accompany frontal passages, generally during late winter and spring, and also precede thunderstorms.

AIR QUALITY

The air quality analysis focused on the following issues raised in the scoping process:

- Effects on people and population centers
- Overall effect of the project on air quality
- Fugitive dust impacts
- Visibility (as measured by plume perceptibility)
- Acid precipitation
- Compliance with applicable federal and state regulations
- Weather modification
- Radionuclides

DIRECT IMPACTS

The impacts of the project's emissions on air quality were assessed for a geographic area in which concentration increases of pollutants were predicted to be greater than the EPA-specified concentration levels defined in EPA's Interpretive Ruling (40 CFR 51.18, Appendix S). These values are given below.

Computer-simulated dispersion modeling of pollutant emissions from NMGS was conducted to predict concentration increases. The area in which concentrations were predicted to be greater than these levels was a region extending approximately 47 miles in the southwest and westerly directions. In the other directions, concentration increases due to NMGS fall below the EPA-specified levels within 30 to 38 miles. As such, concentration increases due to NMGS in the San Juan River valley (including the Farmington area) have been predicted to be below these levels.

In addition to the above areas, Mesa Verde National Park and the San Pedro Parks Wilderness Area were examined because they were identified as areas of special interest in public scoping meetings.

INDIRECT IMPACTS

Indirect impacts associated with air quality are mainly related to concerns about acid precipitation. The area of influence for acid precipitation impacts comprises the San Juan Basin and high mountain lake areas of Colorado and northern New Mexico. This area represents the area immediately surrounding NMGS. The high mountain lakes are the closest sensitive receptors to acid precipitation (based on bedrock geology) to NMGS.

Acid Precipitation

Precipitation is naturally somewhat acidic because of the dissolution of atmospheric carbon dioxide (CO_2). The term "acid precipitation" is generally applied to precipitation with pH lower than 5.6, indicating that acid precursors other than

Pollutant		Averaging Time				
		Annual	24 Hours	8 Hours	3 Hours	1 Hour
SO_2 ($\mu g/m^3$)	1.0	5.0	-	25.0	-	
TSP ($\mu g/m^3$)	1.0	5.0	-	-	-	
NO_2 ($\mu g/m^3$)	1.0	-	-	-	-	
CO ($\mu g/m^3$)		-	-	500	-	2000

CO_2 cause the acidity. Th predominant acid precursors of precipitation with a pH lower than 5.6 are sulfur oxides (SO_x) and nitrogen oxides (NO_x), of which fossil-fuel-burning power plants are a major source.

The presence and environmental effects of acid precipitation have been measured in the eastern part of the United States, which has higher atmospheric loadings of sulfur and NO_x and poorly acid-buffered soils. To date, no conclusive baseline studies have established that similar acid precipitation potential exists for the Southwest in general and the San Juan Basin in particular. Factors in the San Juan Basin that may decrease the potential for acid precipitation include less precipitation, low humidity, and more alkaline (buffered) soils. High mountain areas in northern New Mexico and Colorado (National Atmospheric Deposition Program 1982) would have the highest potential for acid precipitation effects from activities in the San Juan Basin because of higher precipitation amounts, low baseline pH, and lower buffering capacity.

Visibility

Visually significant points of interest in the project region include the Bisti and De-na-zin Wilderness Study Areas (WSAs), Chaco Culture National Historical Park, Shiprock, and the Class I areas of Mesa Verde National Park. Other visual points of interest are the Chuska Mountains and the San Pedro Parks Wilderness Area. The National Park Service has conducted visibility monitoring for Mesa Verde National Park, Chaco Culture National Historical Park, and Bandelier National Monument. The standard visual range in these areas exceeds 100 miles approximately 90 percent of the time. Standard visual range has been measured as 216 miles approximately 10 percent of the time at CCNHP. Median visual range is 128 miles.

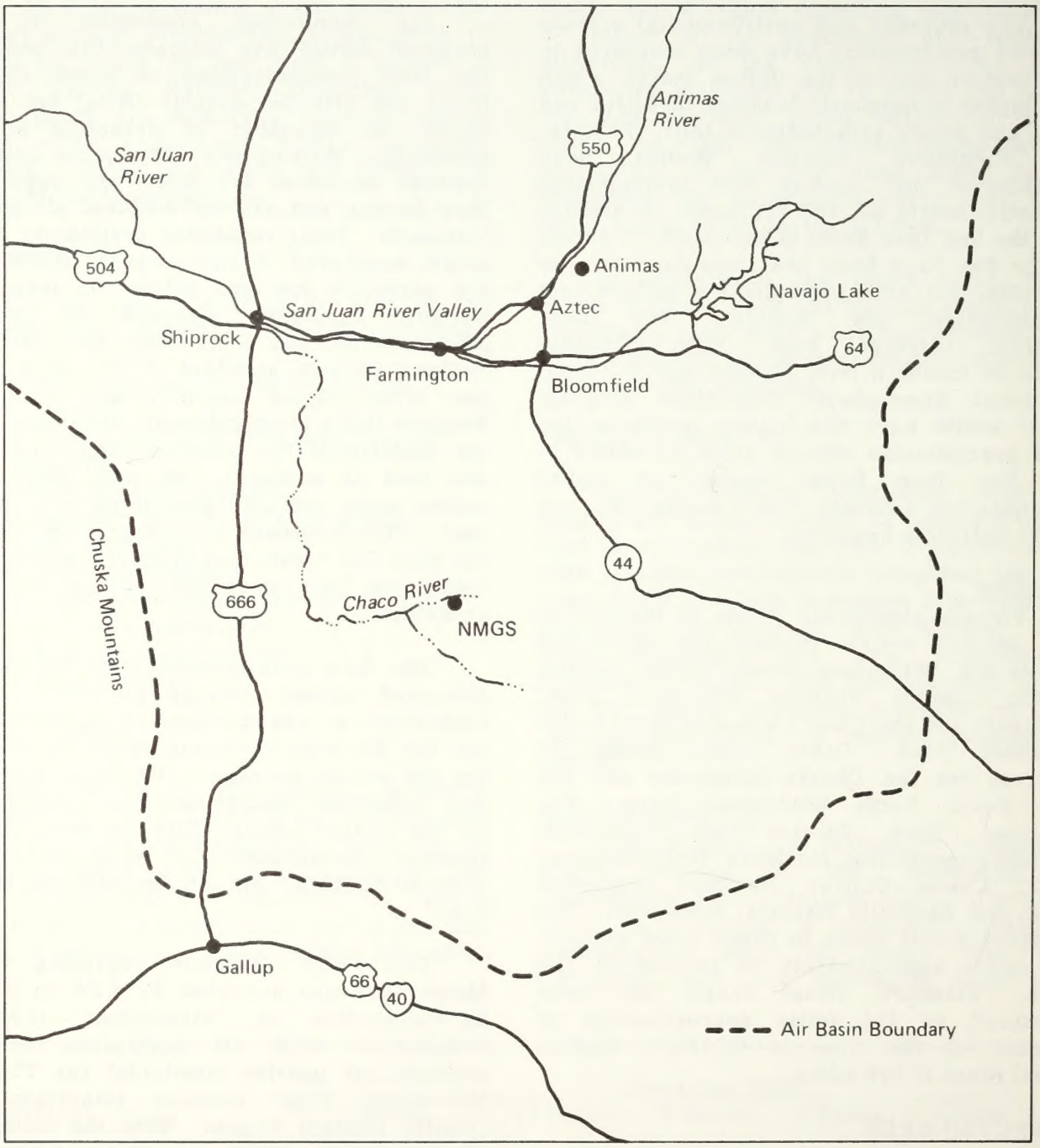
AFFECTED AREA

The region that would be directly affected by air emissions from the proposed NMGS is located within the San Juan Air Basin (Map 2-1), in the Four Corners Interstate Air Quality Control Region (AQCR No. 014). The area is characterized as high, flat desert surrounded by mesas and mountains. Most of the ground surface area is exposed, with ground cover averaging less than 10 percent.

Air monitoring conducted at the proposed NMGS site indicates that most of the time concentrations of sulfur dioxide (SO_2) and nitrogen dioxide (NO_2) are at or below the threshold of detection of the monitoring instruments. Maximum concentrations measured are below the applicable New Mexico and national ambient air quality standards. Total suspended particulate (TSP) levels monitored at the proposed NMGS site are generally low and below the state and national standards, although on approximately 4 percent of the days the state and national 24-hour standard of 150 micrograms per cubic meter ($\mu g/m^3$) was exceeded. Because there is no industrial development in the vicinity of the proposed NMGS site and the land is semiarid, the high particulate values were probably caused by wind-blown dust. This inference is further supported by the high TSP levels that occurred during May, June, and July, when dust storms are most prevalent.

The EPA recommends using the lowest measured annual average particulate concentration as the background concentration for the 24-hour averaging period as well as for the annual average. EPA calls this level the "nonurban" background and recommends its use in rural areas. This has been done to represent background TSP levels in the San Juan River valley and at the proposed NMGS site.

The above rationale regarding wind-blown dust was accepted by EPA in issuing its designation of "attainment" (i.e., in compliance with all applicable national ambient air quality standards) for TSP for the entire Four Corners Interstate Air Quality Control Region. With the exception of SO_2, this AQCR has been designated "attainment" for all criteria air pollutants. A small area outside Farmington and the northern portion of San Juan County have been designated "nonattainment" for SO_2. Because of the future requirement for



Source: BLM 1982.

Map 2-1. SAN JUAN AIR BASIN

increased pollution control for the power plants in this area, it is anticipated that the area will be designated "attainment" for SO_2 by the time NMGS would come on-line.

Tables 2-1 and 2-2 present the average of maximum concentrations recorded in the San Juan River valley as well as comparisons with the New Mexico and federal ambient air quality standards, respectively. Tables 2-3 and 2-4 present the maximum concentrations recorded at the project site and comparisons with the respective New Mexico and federal standards.

Because of more stringent limitations on particulate matter and SO_2 emissions from coal-fired power plants, these emissions will be substantially reduced in the San Juan Air Basin by the time NMGS would come on-line. The baseline levels of TSP and SO_2 are thus likely to be lower than the values currently recorded. Because of interest in this region raised in scoping meetings, baseline values without NMGS have been computed and are discussed in fuller detail in the Air Quality Technical Report.

NOISE

Noise impacts were analyzed for all locations identified as sensitive receptors. These areas include the Bisti and De-na-zin WSAs and Chaco Culture National Historical Park.

The project area is in a remote location in which the only major nonnatural noise sources are vehicles traveling on roads. For the purposes of this analysis, the Bisti and De-na-zin WSAs have been identified as potential sensitive receptors. No other sensitive receptors (Chaco Culture National Historical Park) were determined to be potentially affected. Baseline noise levels in the vicinity are represented by levels measured in the De-na-zin WSA. A baseline level of 32 to 35 decibels on the A-weighted scale (dB[A]) is considered representative of the current noise baseline in secluded areas in the geographic area of influence. In areas near roadways, it is expected that noise levels would be slightly higher.

Projects in Baselines 1 and 2 were examined for purposes of determining potential noise impacts in the geographic area of influence. The only noise source identified would be the mine that would be located near the NMGS coal- and ash-handling facilities (the "hypothetical mine"). The noise levels at the Bisti and De-na-zin WSAs were projected using the noise modeling techniques. Such modeling took into account the noise levels associated with the hypothetical mine: various pieces of equipment, automobile and haul truck traffic, and blasting. From this analysis, the noise baseline was projected to be in the range of 47 to 76 dB(A) at the Bisti WSA (NM 371) and 35 to 71 dB(A) at the De-na-zin WSA (County Road C-15) depending on the distances from the roads adjacent to these WSAs and the time of day.

GEOLOGIC SETTING

The geologic area of influence for geologic resources is defined as the actual area that would be occupied by individual project components.

The NMGS would be located within the San Juan Basin, which is a structural depression underlain by Tertiary, Cretaceous, and older sedimentary rocks. A thin veneer of Late Quaternary deposits covers the bedrock units over much of the area. Volcanic necks and potentially active faults border the basin on the east. The surface of the San Juan Basin has been strongly eroded, creating badlands, buttes, mesas, and dissected plateaus. The interior of the San Juan Basin is relatively inactive tectonically, but may be subject to the effects of relatively distant earthquakes that could cause local bedrock accelerations up to about 0.2g.

Landslide blocks border many of the buttes, mesas, and plateaus, and deposits of baked shale produced by spontaneous combustion of coal are widespread. Soils with a variety of engineering defects are present in the general region (Table 3-4).

MINERAL RESOURCES

The geographic area of influence for mineral resources includes the area that would be occupied by the project components and noncontiguous areas from which mineral

Table 2-1. COMPARISON OF THE AVERAGE OF THE MAXIMUM CONCENTRATIONS OBSERVED IN THE SAN JUAN RIVER VALLEY WITH NEW MEXICO AMBIENT STANDARDS

Pollutant	Sampling Time	Average Concentration[a]	New Mexico Standard
SO_2	Annual	0.008 ppm	0.020 ppm
	24-hour maximum	0.043 ppm	0.100 ppm
NO_x	Annual	0.011 ppm	0.050 ppm
	24-hour maximum	0.070 ppm	0.100 ppm
NO_2	Annual	0.007 ppm	0.050 ppm
	24-hour maximum	0.036 ppm	0.100 ppm
Particulates	Annual value[b]	39 $\mu g/m^3$	60 $\mu g/m^3$
	24-hour value[b]	39 $\mu g/m^3$	150 $\mu g/m^3$

[a]Reported at 633 mm Hg and 25°C.

[b]Representative values used for baseline.

Table 2-2. COMPARISON OF THE AVERAGE OF THE MAXIMUM CONCENTRATIONS OBSERVED IN THE SAN JUAN RIVER VALLEY WITH FEDERAL AMBIENT AIR STANDARDS

Pollutant	Sampling Time	Average Concentration[a] ($\mu g/m^3$)	Federal Standard ($\mu g/m^3$)
SO_2	Annual	21	80
	24-hour maximum	112	365
	3-hour maximum	356	1300
NO_2	Annual	13	100
Particulates	Annual value[b]	47	75
	24-hour value[b]	47	150

[a]Calculated at 760 mm Hg and 25°C.

[b]Representative values used for baseline.

Table 2-3. COMPARISON OF MAXIMUM CONCENTRATIONS OBSERVED AT THE PROJECT SITE WITH NEW MEXICO AMBIENT STANDARDS

Pollutant	Sampling Time	Maximum Concentration[a]	New Mexico Standard
SO_2	Annual	0.001 ppm	0.020 ppm
	24-hour maximum	0.021 ppm	0.100 ppm
NO_x	Annual	0.002 ppm	0.050 ppm
	24-hour maximum	0.030 ppm	0.100 ppm
NO_2	Annual	0.002 ppm	0.050 ppm
	24-hour maximum	0.052 ppm	0.100 ppm
Particulates	Annual value[b]	35 $\mu g/m^3$	60 $\mu g/m^3$
	24-hour value[b]	35 $\mu g/m^3$	150 $\mu g/m^3$

[a]Reported at 633 mm Hg and 25°C.

[b]Representative values used for baseline.

Table 2-4. COMPARISON OF MAXIMUM CONCENTRATIONS OBSERVED AT THE PROJECT SITE WITH FEDERAL AMBIENT STANDARDS

Pollutant	Sampling Time	Maximum Concentration[a] ($\mu g/m^3$)	Federal Standard ($\mu g/m^3$)
SO_2	Annual	3	80
	24-hour maximum	55	365
	3-hour maximum	172	1300
NO_2	Annual	4	100
Particulates	Annual value[b]	42	75
	24-hour value[b]	42	150

[a]Calculated at 760 mm Hg and 25°C.

[b]Representative values used for baseline.

products to be used at the plant might be obtained, as follows:

- Areas immediately underlying proposed project features
- San Juan River Valley (probable gravel quarry)
- Grants region (possible limestone quarry)
- Southeastern Utah (possible limestone quarry)
- Southwestern Colorado (possible limestone quarry)
- Belen area (possible limestone source 34 miles west)

Deposits of coal and baked shale are present at the proposed NMGS site. Large deposits of actively mined limestone (which could be used in the NMGS emission control process) are present near Grants and Belen, and in adjacent states in the Four Corners area.

PALEONTOLOGICAL RESOURCES

The areas of direct ground-disturbing impacts include construction zones for the plant facilities, water supply system, and transmission system. Long-term operation and maintenance of the facilities (including access roads) would also contribute to direct impacts to the area's paleontological resources.

Paleontological resources in the area considered to be the recreation resource base, those activity areas considered to be a reasonable (100 miles one way) day's drive from the major residence communities (especially Farmington and Gallup), would receive indirect impacts as a result of the proposed project.

AFFECTED AREA

The San Juan Basin has been known as an area rich in paleontological resources for more than a century. The fossils found in the basin's bedrock formations include marine invertebrates, plant mega- and microfossils, and vertebrates. The vertebrate fossils range in size from tiny teeth of mouse-sized animals to fragmentary remains of dinosaurs. Numerous research projects are currently being conducted in the area. This research includes efforts to identify factors that may have resulted in the decline and extinction of the dinosaurs and many other animal groups at the close of the Cretaceous period.

Most of the NMGS site lies on the Fruitland Formation, and a small portion of its western edge overlies the Pictured Cliffs Sandstone. Only about 10 percent of the site has bedrock exposures; the remaining 90 percent is covered by a veneer (less than 5 feet thick) of Quaternary alluvium.

Three occurrences of fossils have been reported from the proposed plant site area, all from Fruitland Formation bedrock exposed along its southern edge. None of these occurrences included significant fossils. However, the reported distribution of fossils in adjacent areas strongly suggests that this small number of reported occurrences reflects only the relatively small area of bedrock exposure on the plant site itself. The bedrock below the thin surficial Quaternary deposits is expected to be quite rich in potentially significant fossils. Well-preserved vertebrate, invertebrate, and plant fossils have been recovered from exposures at the north edge of De-na-zin Wash, less than 1 mile from the north boundary of the proposed plant site and at approximately the same stratigraphic level. In addition, extremely abundant and often well-preserved vertebrate, invertebrate, and plant fossils have been recovered from a similar stratigraphic position from exposures in Hunter Wash (Bisti Badlands) between 2 and 5 miles north-northwest of the proposed plant site. Fruitland exposures located both to the west and the east (including the Fossil Forest), which stratigraphically bracket the proposed plant site, have also yielded abundant significant fossils.

BLM locality files record an average of 39 fossil occurrences per square mile of bedrock exposure in the Bisti Badlands. A comparable abundance can be expected in the Fruitland Formation within the proposed plant site boundaries. Fossils have been reported from nearly all lithologies within the Fruitland Formation, but significant concentrations of fossils, particularly fossil vertebrates, are most frequent in cross-bedded channel sandstones. Fossils are not abundant in the Pictured Cliffs Sandstone.

SOILS

Direct impacts to the soils resource were assessed for areas that would be directly disturbed (e.g., NMGS site, ROWs, and reservoir sites) during construction, operation, and maintenance of the Proposed Action or alternatives.

Indirect impacts to the soils resources were generically assessed for areas where increased ORV access would be expected. Construction of new ROWs (e.g., pipeline and transmission lines) would allow some previously inaccessible areas to be accessible to ORVs. The real extent of such ORV activities is unknown, but it would probably be limited to about 5 miles on each side of new ROWs.

The soils that are present in the area proposed for location of the generating station have resulted primarily from erosion and weathering of sedimentary parent materials (e.g., sandstone, shale, and siltstone). Surface textures are primarily sandy, but range from very fine sand to clay. Many of the identified soils are moderately to highly susceptible to wind-induced erosion, while water erosion susceptibility is generally low to moderate. Table 2-5 summarizes the aspects of the existing soils environment that may contribute to soil reclamation problems for NMGS.

The soils identified at the generating station site are generally not very productive because of low available moisture, low organic matter content, and undersirable physical and chemical characteristics.

PRIME AND UNIQUE FARMLAND

The geographic area of influence for this resource includes all locations where surface facilities associated with the Proposed Action or alternatives (e.g., San Juan River intake, pump stations, NMGS, reservoir site, or transmission towers and substations) could take prime or unique farmland out of production.

The surface facilities associated with the proposed NMGS site would not be located on prime or unique farmland.

HYDROLOGY

Direct impacts associated with the generating station would be most likely to occur in the drainage area of De-na-zin Wash in the vicinity of the plant site. De-na-zin Wash, which flows east to west across the northern portion of the plant site (Map 2-2), is an ephemeral stream that flows mainly as a result of localized high-intensity thunderstorms. The channel is relatively wide, ranging from approximately 400 to 600 feet in the vicinity of the plant site. De-na-zin Wash is relatively shallow, and for the most part the banks of the channel are steep and sharply defined.

Alluvium fills the channels of arroyos throughout the study area. The composition of the alluvium ranges from silty clay to poorly sorted sand and gravel. In general, the finer-grained alluvium is found flooring the clay flats in the minor drainages close to predominantly shale or claystone source areas. Coarser sediments are found as channel fillings associated with the more important drainages. The thickness of alluvium ranges from near zero to an unknown maximum. The average thickness penetrated by monitoring wells in De-na-zin Wash in the vicinity of the plant site is 30 feet. Where saturated, the alluvium in the channels of arroyos in the vicinity of the plant site area are used for domestic supply and livestock watering.

WATER QUALITY

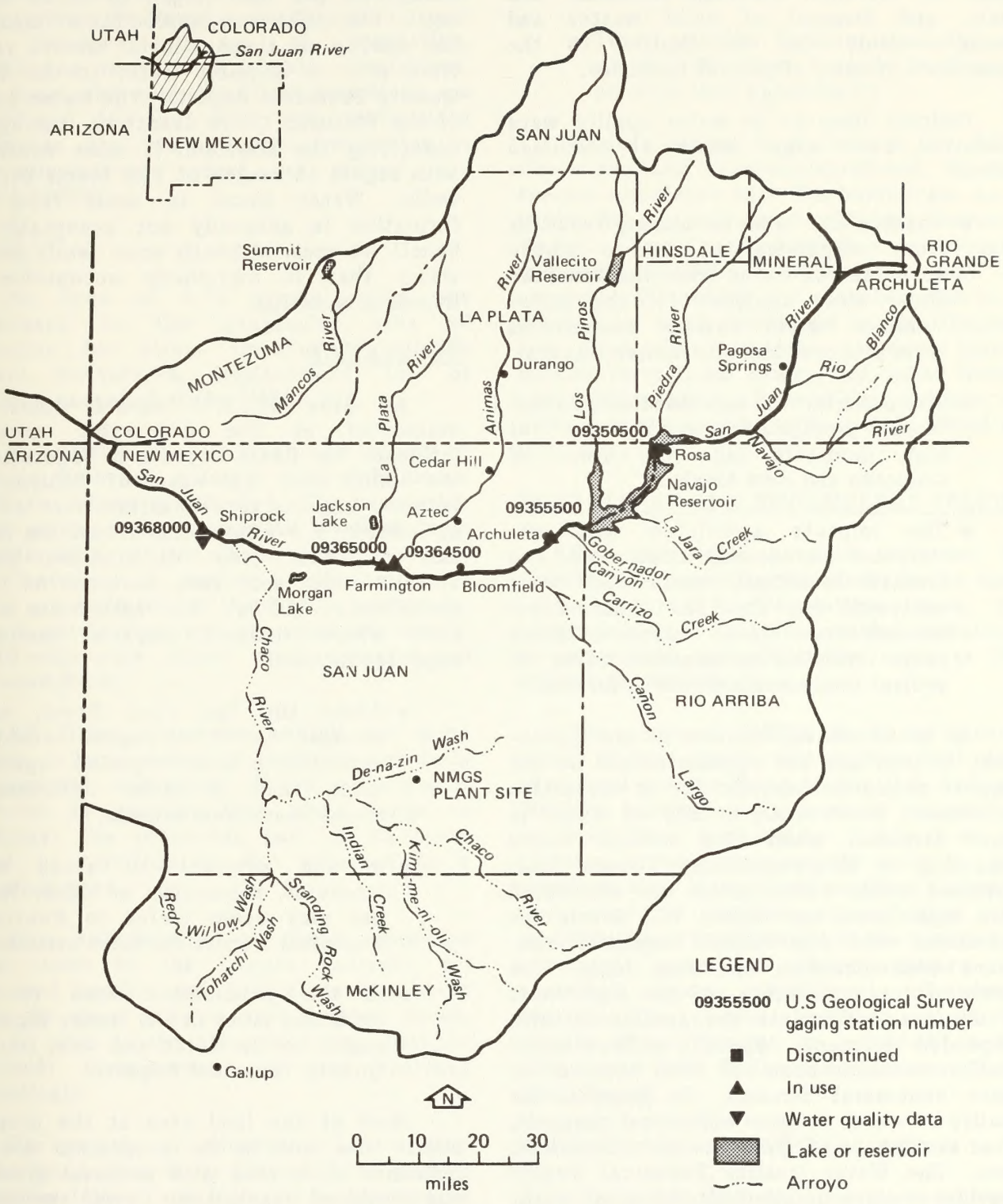
Several factors were important in shaping the framework for analysis. The description of the project (including the design, construction, and operation aspects of various components) was the most important factor driving the analysis. This factor was used to define the geographic area of influence, as well as the generic effects of individual project components. Scoping analysis reinforced the above approach by reemphasizing important issues. Relevant water quality data were then collected in the defined areas of influence.

Direct impacts to water quality as the result of construction and operation of project components were assessed for areas

Table 2-5. SUMMARY OF POTENTIAL SOILS RECLAMATION PROBLEM AREAS AT THE PROPOSED NMGS 2400-ACRE SITE

Indicators of Potential Reclamation Problems		
High Wind Erosion Susceptibility (% of total)	High Water Erosion Susceptibility (% of total)	Steep Terrain (% of total)
2346 acres (97.7%)	168 acres (7.0%)	54 acres (2.3%)

[a]See Table 10 in the Soils and Prime and Unique Farmlands Technical Report for a listing of potential reclamation problem areas by soil association and acreage (including pertinent comments and potential mitigation measures). Table 10 also lists (or refers to) data sources, and the approach and criteria used in the compilation of this table.



Source: Adapted from U.S. Bureau of Reclamation (1976)

Map 2-2. SAN JUAN RIVER BASIN

in the immediate vicinity of project facilities. Other potential effects, such as spills of solvents, cleaning solutions, and fuels, and disposal of solid wastes and sewage, would also be limited to the immediate vicinity of project facilities.

Indirect impacts to water quality were evaluated over larger areas, as discussed below:

- The impacts to water quality resulting from withdrawal of up to 35,000 acre-feet of water from the San Juan River were analyzed for the entire Colorado River System downstream from proposed and alternative intakes.

- The potential for increased acidity due to acid precipitation was discussed for high mountain lakes in areas of Colorado and New Mexico.

- The impacts associated with anticipated increases in urban runoff and treated municipal wastewater were analyzed for the San Juan River downstream from areas where project-related population influx or project components would be located.

As noted above, streams at the generating station site are ephemeral and do not support permanent aquatic life or recreation activities. The overall quality of water in these streams, when flow occurs, varies according to flow conditions. Lower total dissolved solids (TDS) levels are associated with high flows and higher TDS levels are associated with low flows. Suspended sediment concentrations are very high. The levels of trace elements are also high; most of the trace elements are associated with suspended sediments. Specific surface-water quality standards have not been adopted for these ephemeral streams. In general, the quality of water in those ephemeral channels, after settling, is adequate for most beneficial uses. The Water Quality Technical Report provides a more detailed discussion of water quality near the plant site.

Water withdrawn from the alluvium near the generating station site has TDS levels ranging from below the New Mexico state standard for domestic water use of 1000 milligrams per liter (mg/l) to about 60,000 mg/l. For other New Mexico state standards, the quality of these alluvial waters ranges from poor to unusable (refer to the Water Quality Technical Report). The water quality of the Pictured Cliffs Sandstone (the aquifer underlying the alluvium) is more consistent with regard to ranges of TDS levels between wells. Water found in wells from this formation is generally not acceptable for beneficial uses, although some wells provide water that is marginally acceptable for livestock watering.

VEGETATION

An area of 3.75 square miles was delineated as the geographic area of influence for direct impacts to vegetation at the NMGS site. The areas of influence for indirect impacts to vegetation were defined as follows: a 5-mile radius around the NMGS site or other point disturbance, and a 10-mile-wide study area centered on linear disturbances (ROWs). Two exceptions to the area where indirect impacts would be expected include:

- Along the San Juan River, where changes in flow regime could be expected to affect riparian vegetation more than 5 miles upstream or downstream from intakes.

- In and adjacent to areas where increased recreation or other human use may occur (refer to Recreation Technical Report for these estimates)

- In the generalized area of high mountain lakes in the Rocky Mountain region to the north and west (see Air Quality Technical Report)

Most of the land area at the proposed NMGS site and in its geographic area of influence is covered with semiarid grassland and shrubland vegetation. Lesser amounts of sand wash and saline lowland and badland vegetation types are also present in the area. Water is the most important factor limiting plant growth and production.

Grazing and browsing by domestic livestock and wildlife, as well as use of native plants by Navajos, are the only current and foreseeable uses of vegetation, considering water and climatic limitations. The vegetation and rangeland conditions are considered fair to poor and productivity estimates are low. Forage production is approximately 15 acres per animal unit month (AUM).

WILDLIFE

An area of 3.75 square miles was delineated as the geographic area of influence for direct impacts to wildlife (direct mortalities, displacement, loss of carrying capacity) at the NMGS site.

In addition to the areas that would be directly disturbed, a larger area of influence could be indirectly affected. The geographic areas where indirect impacts resulting from considerations of the "home range" concept and increases in human population might occur are defined for the NMGS project as: (1) a 5-mile radius from the plant site and (2) a 10-mile-wide study area centered on proposed ROWs.

All living organisms exhibit, to some degree, a home range or territory and daily or seasonal migration. If an organism is affected in part of that home range or territory, the remaining part of its home range or territory is also affected to a certain degree.

Two adjustments to these estimates were made in the impact analysis: (1) increased hunting and fishing pressure could occur in areas outside ones defined above, and (2) acid precipitation is a long-distance transport phenomenon and was analyzed accordingly.

The quantity of wildlife and habitat that might be destroyed or disturbed by project activities (direct and indirect) was compared with the total present in the regional area defined by a 10-mile radius from the plant site, and a 20-mile linear study area centered on ROWs and associated access. Total wildlife habitat present in the regional area defined was calculated based on two baselines:

- Total wildlife habitat available assuming Baseline 1
- Total wildlife habitat available assuming Baseline 1 and Baseline 2 projects (see Appendix C)

Wildlife habitat in the area of the NMGS site is semiarid grassland/shrubland. Wildlife species associated with this habitat are listed in the Wildlife and Aquatic Biology Technical Report. Small and medium-size nongame mammals, including coyote and fox, are common. Waterfowl and shorebird habitat is limited to small tanks and ponds. Raptors are relatively abundant; common species include ferruginous hawks, red-tailed hawks, and golden eagles. Several raptor nests are present in the area of influence identified for the NMGS site.

THREATENED AND ENDANGERED SPECIES

The geographic area of influence for threatened or endangered plants is the same as that defined for Vegetation, above. The geographic area of influence for threatened or endangered animals is the same as that defined for wildlife.

The proposed NMGS would be located within or near the current or historical range of several species listed by the U.S. Fish and Wildlife Service as threatened, endangered, or candidates for review (Table 2-6). In addition, several other species occur in areas (northern New Mexico and southern Colorado) that may be subject to potential acid precipitation. Summaries of the current or historical range of these species are presented below. Additional information regarding the relative abundance and habitat use of these species is provided in the Threatened and Endangered Species Technical Report.

WILDLIFE AND AQUATIC SPECIES

Bald Eagle. No bald eagle nests are reported in the high mountain areas of northern New Mexico and southern Colorado where there is the greatest potential for acid precipitation. Although the high mountain areas in northern New Mexico and southern Colorado support relatively few bald eagles during migration periods, bald eagles are relatively common

Table 2-6. FEDERALLY LISTED SPECIES[a] (THREATENED, ENDANGERED, OR CANDIDATES FOR REVIEW) THAT ARE REPORTED TO OCCUR[b] IN AREAS THAT COULD BE AFFECTED BY CONSTRUCTION OR OPERATION OF PROJECT COMPONENTS

Common Name	Scientific Name	General Location of Potential Habitat			
		NMGS	Water Supply System	Transmission Lines	Areas That Could Be Affected by Potential Acid Precipitation
Listed					
Black-footed ferret	Mustela nigripes	—	—	x	—
Bald eagle	Haliaeetus leucocephalus	—	x	—	x
Peregrine falcon	Falco peregrinus	—	—	—	x
Humpback chub	Gila cypha	—	—	—	x
Bonytail chub	Gila elegans	—	—	—	x
Greenback cutthroat trout	Salmo clarki stomous	—	—	—	x
Colorado squawfish	Ptychocheilus lucius	—	x	—	x
Mesa Verde cactus	Sclerocactus mesae verdae	—	x	x	x
Spineless hedgehog cactus	Echinocereus triglochidiatus var. inermis	—	—	—	x
Knowlton's cactus	Pediocactus knowltoni	—	—	—	x
Candidate Animal Species					
Bluntnose shiner	Notropis simus	—	x	—	x
Candidate Plant Species					
Zuni milkvetch	Astragalus accumbens	—	—	—	x
Fleabane	Erigeron rhizomatus	—	—	—	x
Devil's claw cactus	Sclerocactus whipplei var. heilii	—	—	—	x
Bladderpod	Lesquerella pruinosa	—	—	—	x
Mancos milkvetch	Astragalus humillimus	—	—	—	x
Annual saltbush	Atriplex pleiantha	—	—	—	x

[a]Source: U.S. Fish and Wildlife Service response to BLM List Request.

[b]Reports of occurrence include historical sightings in addition to recent observations or presence of potential habitat.

winter residents along major streams and reservoirs throughout the lower elevations of northern New Mexico and southern Colorado.

Peregrine Falcon. Peregrine falcons occur as migrants throughout the high mountain areas of northern New Mexico and southern Colorado. No nesting or important foraging habitat is reported in these areas.

Humpback Chub. Historically, the humpback chub inhabited the large tributaries of the Colorado River system. Present distribution is disjunct, and humpback chubs occur in widely isolated canyons. Although none are reported in New Mexico, their occurrence in southern Colorado is likely.

Bonytail Chub. Historically, the distribution of the bonytail chub also included most of the large tributaries of the Colorado River system. The bonytail has not been reported recently in New Mexico or Colorado (since 1960), but it does occur in the Green River in Utah.

Greenback Cutthroat Trout. The greenback cutthroat trout inhabits clear, cold, well-oxygenated headwater streams in high mountain areas of southern Colorado. The streams are susceptible to increases in acidity because they lack the buffering capacity of lower elevation streams.

Colorado Squawfish. Construction of the Navajo Reservoir, water depletions, and irrigation flow returns have probably resulted in the extirpation of the Colorado squawfish in the San Juan River. In areas of the Colorado drainage that could be affected by acid precipitation, the squawfish is present, but numbers and distribution are limited.

PLANTS

Mesa Verde Cactus. The distribution of Mesa Verde cactus is limited to a few locations in southwestern Colorado and San Juan County, New Mexico. It generally occurs at lower elevations on shale badlands, including parts of the Fruitland and Kirtland formations. According to recent information and analysis of potential habitat (New Mexico Heritage Program 1982), the plant appears to occur west of R13W in New Mexico and is not expected to occur in the vicinity of the proposed NMGS project.

Spineless Hedgehog Cactus. The known distribution of this cactus is restricted to extreme eastern Utah, and Mesa, Montrose, and Ouray counties in western Colorado at elevations between 5000 and 8000 feet. Soils in the collection areas are derived from calcareous sandstone.

Knowlton's Hedgehog Cactus. The known distribution of this cactus is limited to a small portion of the Los Pinos River valley between La Boca, Colorado, and the Navajo Lake Dam in New Mexico (Knight 1982). Reports of other collections in southern Colorado have not been verified (Knight 1982). Soils in collection areas (6000-7000 feet elevation) have been derived from sandstone and shale, are alkaline, and have soil pH levels between 7.4 an 8.4.

Zuni Milkvetch. The Zuni milkvetch is a New Mexico endemic, reported only from the Zuni Mountains southeast of Gallup, but outside the area of project component disturbance and potential acid precipitation. The species is restricted to a red clay found below sandstone cliffs (New Mexico Heritage Program 1982).

Fleabane. Fleabane is restricted to geologic formations south of Fort Wingate, New Mexico (New Mexico Heritage Program 1982). This distribution is outside the area of influence for project components and is also outside the area with the highest potential for acid precipitation.

Devil's Claw Cactus. Variety heilli of Sclerocactus whipplei is reported from northern San Juan County, north of the San Juan River, in black sagebrush and pinyon-juniper vegetation types. This distribution lies outside the area of influence for project component disturbance but within the area where acid precipitation could occur.

Bladderpod. The known distribution of bladderpod is restricted to the vicinity of Pagosa Spring in Archuleta County, Colorado, on adobe soils at 7000 feet elevation. This

distribution is outside the area of disturbance resulting from project components but within the area where acid precipitation could occur.

Mancos Milkvetch. Mancos milkvetch is reported from two locations on Hogback Mountain in New Mexico at elevations between 5240 and 5320 feet above sea level. Its known soil preference is limited to deep sandy soils on ledges and flat locations. This distribution is outside the areas of disturbance that would result from project components but within the area where acid precipitation could occur. The buffering ability of soils associated with this plant is unknown.

Annual Saltbush. This species is reported from southwestern Montezuma County, in Colorado and in New Mexico on clay slopes of low hills at approximately 5100 feet elevation. This distribution is outside the area of disturbance that could occur from project components but within the area where acid precipitation could occur.

CULTURAL RESOURCES

The areas of direct ground-disturbing impacts include construction zones for the plant facilities, water supply system, and transmission system. Long-term operation and maintenance of the facilities (including access roads) would also contribute to direct impacts to cultural resources in the project area.

Cultural resources in the area considered to be in the recreation resource base, those activity areas considered to be a reasonable (100 miles one way) day's drive from the major residence communities (especially Farmington), would receive indirect impacts as a result of the proposed project.

AFFECTED AREA

The San Juan Basin has been inhabited for at least the past 11,000 years and retains a complex record of that human occupation. Archaeologically, the area is best known at present for its record of the Chacoans, a prehistoric Anasazi people who lived in the region from AD 500 to AD 1300. However, it also holds significant remains of earlier Paleo-Indian and Archaic cultures and later Navajo history. It is the traditional as well as present home of several Native American peoples, especially the Navajo but also the Ute to the north, the Jicarilla Apache to the east, and the Puebloans to the south and southeast. Finally, it has a sparse but significant record of historic Euroamerican habitation of the area. Archaeological and ethnological studies of prehistoric and modern cultural resources have been conducted in this area for a century, providing a basis for understanding the significance of those resources. At the same time, the complexity of this cultural resource base is such that, at present, only a small portion of it is described in sufficient detail for making specific management decisions. Such decision making must therefore rely on understanding both the undescribed resources (based on professional judgement) and the identified data. In this effort to compile known resources, the National Register of Historic Places and many other references were consulted.

A comprehensive (Class III) cultural resource survey has been completed at the proposed NMGS site. This survey has identified 40 archaeological sites there. Eighteen of these sites have Archaic remains (between 6000 and 2000 years old), 5 are Anasazi-related, 8 are Navajo, 2 are historic, and the rest are of unknown cultural affiliation. Of these, 21 have been recommended by the State Historic Preservation Officer to be eligible for the National Register of Historic Places and 3 have been declared ineligible; the rest have not yet been evaluated. In addition, 8 sites of significance to traditional Native American religious values and practices have been identified there, including a battlefield, an abandoned hogan where death has occurred, several gathering areas, a rock art site, an several religious ritual sites.

The area potentially subject to indirect impact by the proposed NMGS includes the entire San Juan Basin, as well as the Four Corners region of southwestern Colorado (especially Montezuma and Dolores counties), southeastern Utah, and northeastern Arizona. This area is included in the recreation resource base as defined for this

analysis. It is the appropriate unit for evaluating potential indirect project effects on cultural resources, since a popular recreational activity in northwestern New Mexico is the surface collection of archaeological materials. In the San Juan Basin alone, the New Mexico Historic Preservation Bureau estimated that, as of 1979, 5 percent of the area had been professionally surveyed and over 9600 prehistoric sites had been identified. A similar density of materials is found in southwestern Colorado, where recent sample surveys have identified as many a 98 sites per square mile in portions of Montezuma County. Thus it is likely that over 100,000 archaeological or historic sites and a large but presently unknown number of traditionally important Native American resources occur in the indirect impact study area.

VISUAL RESOURCES

The area of influence for visual resources includes a primary and a secondary zone. The primary zone is the area surrounding each of the project components and alternatives from which visual contrasts resulting from the project features and landscape disturbance could be seen by the naked eye at ground level. This zone includes a 12-mile radius around the plant site,* a study area 5 miles wide on each side of the transmission lines, and a study area 3 miles wide on each side of the water pipelines.

The secondary zone is included in the analysis to address visible plumes emanating from the plant. Because the visual range on an average day in this region can be more than 128 miles, the study area was enlarged to encompass sites of critical concern, such as Chaco Culture National Historical Park and Mesa Verde National Park.

The scenic quality, sensitivity, and Visual Resource Management (VRM) classes for the NMGS are summarized in Table 2-7. Further description of the visual resource characteristics of the WSAs is contained in the recreation and wilderness discussion, below, because of the overlap with those resources. Critical viewpoints include vantage points within the Bisti and De-na-zin WSAs. Map 2-3 illustrates the region of influence and VRM ratings for landscapes encompassing NMGS components.

RECREATION RESOURCES AND WILDERNESS VALUES

RECREATION RESOURCES

Nonurban recreation resources include the managed areas and dispersed use areas that could be directly or indirectly affected by the construction, operation, maintenance, or abandonment phases of the Proposed Action or alternatives. By definition, this includes recreation lands actually traversed by the project, and those areas where project activities (such as construction noise, dust, and odor) might be noticeable enough to affect the quality of the recreation experience at nearby recreation sites. Included in this recreation inventory are recreation use areas within a 100-mile radius, or one-day's travel distance, from the cities of Farmington, Aztec, and Bloomfield, in San Juan County, where the project labor force is forecast to reside, and where increased visitor use could affect conditions at recreation resources.

Recreation resources include federal, state, and county parks, trails, and waterways where the following types of recreational activities take place: sightseeing, hunting, fishing, winter sports, float-boating, swimming, camping, picnicking,

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* The established 12-mile radius is based on a field study conducted by Woodward-Clyde Consultants, using the Four Corners and San Juan power plants as reference objects. It was concluded that plant facilities of this scale represented a perceivable element in the desert landscape that could adversely affect the scenic quality over a 12-mile range. Although the plant could be seen from more than 20 miles away on clear days, the features are not considered distinguishable enough to result in significant contrasts.

Table 2-7. VISUAL RESOURCE INVENTORY CLASSES FOR LANDSCAPES OCCUPIED BY PROJECT COMPONENTS

Project Component	Quality[a] (percent)	Sensitivity[b] (percent)	Management Objective (percent)	Notes
NMGS Plant Site	100 C	100 Low	100 VRM IV	Natural open landscape, muted colors, sandy clay soils, sparse vegetation, access by NM 371, 3 miles from Bisti WSA, 6 miles from De-na-zin.
Water Pipeline P1	5 A 85 B 10 C	8 Low 92 High	92 VRM III 8 VRM IV	First miles traverse steep, eroded bluffs and mesas near San Juan River, high scenic quality. Parallels New Mexico 371, borders Bisti WSA.
Water Pipeline P2	5 A 80 B	8 Low 92 High	92 VRM III 8 VRM IV	Parallels existing pipeline through Kutz Canyon and NIIP, gently rolling hills, mixed grasses, borders Bisti WSA.
Water Pipeline P3	22 A 16 B 62 C	8 Low 92 High	22 VRM II 60 VRM III 18 VRM IV	Kutz Canyon - steep slopes, badlands formations for first few miles; remainder rolling hills with little variety and visual interest; borders De-na-zin WSA along existing road; crosses Angel Peak Rec. Area.
Dog Eye Reservoir (R1)	100 C	100 Low	100 VRM IV	Common landscapes, little diversity or visual interest, isolated, limited access.
Highway Reservoir (R2)	100 C	100 Low	100 VRM IV	

Table 2-7. VISUAL RESOURCE INVENTORY CLASSES FOR LANDSCAPES OCCUPIED BY PROJECT COMPONENTS (continued)

Project Component	Quality[a] (percent)	Sensitivity[b] (percent)	Management Objective (percent)	Notes
Transmission Line Study Areas				
T1	4 A 96 B	28 Low 72 High	5 VRM II 30 VRM III 65 VRM IV	Rolling hills with intermingled breaks, sagebrush and intermingled pinyon-juniper, light soils, open expansive views, borders De-na-zin WSA, crosses Ojito WSA (4 miles), crosses proposed proposed Continental Divide National Scenic Trail corridor north of Chaco Mesa.
T2	5 A 12 B 83 C	54 Low 46 High	5 VRM II 43 VRM III 52 VRM IV	Gently sloping, broad valleys with intermingled breaks and badlands, light sandy soils; existing 345-kV line, pipelines and secondary roads. Borders on Chaco Culture NHP, expansive views which contribute to interpretation of the park, borders on detached unit of the park, and Ashi-sle-pah WSA. Parallel Chaco Mesa on north side and crosses Cabezon WSA (a scenic volcanic plug). Crosses proposed Continental Divide National Scenic Trail corridor north of Chaco Mesa.

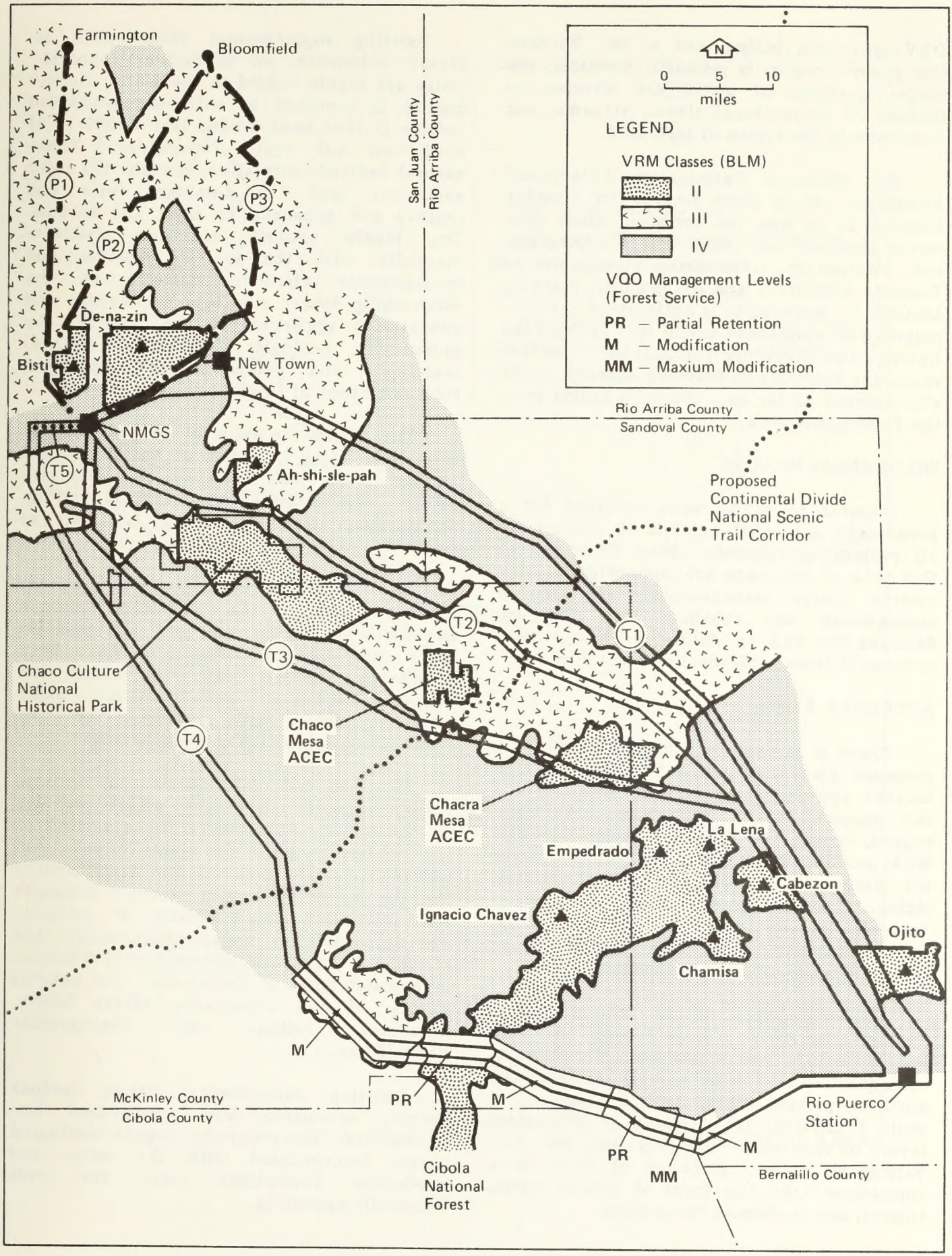
Table 2-7. VISUAL RESOURCE INVENTORY CLASSES FOR LANDSCAPES OCCUPIED BY PROJECT COMPONENTS (concluded)

Project Component	Quality[a] (percent)	Sensitivity[b] (percent)	Management Objective (percent)	Notes
T3	5 A 13 B 82 C	39 Low 48 Med. 13 High	5 VRM II 13 VRM III 82 VRM IV	Undulating hills with scattered tracts of open grasslands, little color variation; scattered range development, residences, and roads; portion borders Chaco Culture National Historical Park and southern edge of Chaco Mesa where it crosses the proposed Continental Divide National Scenic Trail corridor; similar to T2. Crosses Cabezon WSA.
T4	38 B 62 C	24 Low 64 Med. 12 High	4 VRM II 30 VRM III 66 VRM IV 4 F.S. MM 89 F.S. M 7 F.S. PR	10 miles through Cibola National Forest rolling hills, San Mateo Mesa, and Mesa Chivato, ponderosa pine woodlands, Whiterock formation, montane meadows, follows FC-A-P line; crosses proposed Continental Divide National Scenic Trail corridor.
T5	100 C	100 Med.	100 VRM IV	Common landscape; similar to plant site.

[a]Variety classes are obtained by classifying the landscape into different degrees of variety. There are three variety classes that identify the scenic quality of the natural landscape:

Class A--Distinctive; areas that combine the most outstanding characteristics of each rating factor.
Class B--Common; areas in which there is a combination of some outstanding features and some that are fairly common to the physiographic region.
Class C--Minimal; areas in which the features are fairly common to the physiographic region.

[b]Sensitivity levels are a measure of people's concern for the scenic quality of the landscape.



Source: BLM 1982.

Map 2-3. VISUAL RESOURCE INVENTORY CLASSES AND MANAGEMENT OBJECTIVES

ORV operation, hiking, and so on. Because this general region is primarily semiarid, the unique qualities of water are stressed to include all recreational rivers, streams, and reservoirs in the region of influence.

The cities of Farmington, Aztec, and Bloomfield are in State Recreation Planning District 1, as are the proposed plant site, water pipeline, and reservoir. The proposed and alternative transmission lines are in Planning District 1 and extend into Planning District 3. Because it is anticipated that the majority of employees would live in San Juan County, the inventory focuses on recreation resources available in Planning District 1, but also extends as far as a 100-mile radius from the Farmington area.

WILDERNESS VALUES

Impacts to WSAs were assessed for a geographic area that extends 60 miles from all project components. Nine WSAs within this area of influence are currently under an interim policy management. The interim management will continue until Congress declares the WSA an official wilderness area, or drops it from wilderness classification.

AFFECTED AREA

There is no primary recreation use of the proposed plant site area. The Bisti WSA is located approximately 2 miles northwest of the proposed plant site (Map 2-4). The rugged, broken badlands dominating the Bisti WSA provide unique recreation opportunities for hiking, primitive camping, horseback riding, photography, and sightseeing. Because of its natural and uninhabited surroundings, the Bisti WSA also offers an outstanding opportunity for solitude.

The topography of the unit comprises exposed badlands characterized by very rugged terrain and a profusion of compact, rolling hills, broken by narrow washes. The northern portion of the unit is composed of shale formations that consist of alternating layers of sandstones and gray, tan, and olive variegated shales. Outcrops of these shale formations take the form of unique spires, towers, and mushroom formations.

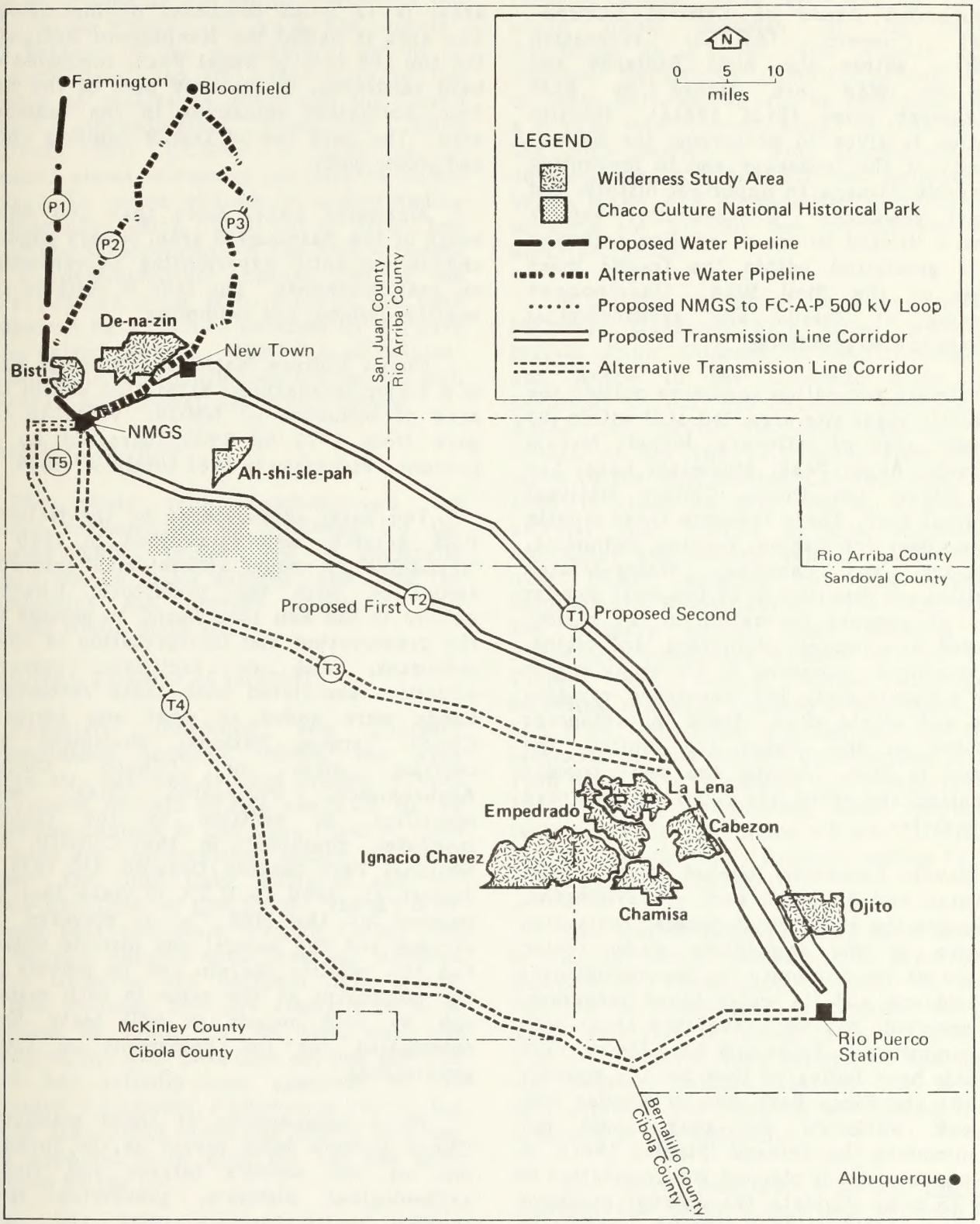
Existing supplemental values such as scenic, scientific, an educational opportunities are highly valued in the WSAs. Scenic quality is provided by soft, unconsolidated sediments that have eroded into a variety of mushroom and spire formations. These natural badlands formations exhibit rich color variations, and the dominant form and texture are enhanced by light and shadow. The highly eroded landscape contrasts markedly with the mottled texture and homogeneous elements present in the surrounding desert grassland. Scientific and educational opportunities are provided by pronounced geologic formations, cultural resources, and paleontological resources, such as a range of fossils and petrified wood.

The De-na-zin WSA is located approximately 6 miles northeast of the plant site. Similar to the Bisti Badlands, this area also offers opportunities for hiking, riding, photography, and sightseeing, as well as solitude.

The De-na-zin WSA generally appears to be natural. The dominant human modifications within the unit are trespass ways or trails. Mitigation has been negotiated through the BLM lands and minerals trespass policies. All other intrusions are well buffered by the surrounding vegetation and topography.

Most of the unit consists of broken, rough, badlands topography, which provides an outstanding opportunity for a variety of user groups to avoid the sights, sounds, and evidence of one another. The large size of the De-na-zin WSA also strongly enhances the wilderness characteristic of solitude. The opportunity to experience primitive and unconfined types of recreation is inherent throughout most of De-na-zin. The unusual nature of the topography offers hiking, horseback riding, and photographic possibilities.

Existing supplemental values include scenic, scientific, and educational opportunities. The sandstone-capped bluffs and mesas intermingled with the spires and mushroom formations make this unit scenically appealing.



Source: BLM 1982.

Map 2-4. GENERAL LOCATION OF WILDERNESS STUDY AREAS

As designated WSAs and BLM-recommended Areas of Critical Environmental Concern (ACEC), recreation activities within the Bisti Badlands and De-na-zin WSA are guided by BLM management plans (BLM 1981a). Specific attention is given to preserving the natural integrity of the landscape and to preventing irreparable damage to important historic and cultural resources. Consequently, vehicle access is limited to use of existing pathways and is prohibited within the fragile inner portion of the Bisti WSA. Unauthorized collecting of fossils and archaeological artifacts is also prohibited.

Primary recreation resources outside the immediate plant site area, but still within the 100-mile area of influence, include Navajo Reservoir, Angel Peak, Bluewater Lake, San Juan River, and Chaco Culture National Historical Park. These resource areas provide opportunities for fishing, boating, swimming, picnicking, and camping. Water-related activities are reported to be the most popular forms of summer recreation in the region, followed by camping, picnicking, and hiking. The combined resources in the study region offer approximately 861 developed camping areas and picnic sites. Since the resources available in the region are limited, the demand is high. Among the most popular recreation resources are those administered by the state.

Navajo Reservoir, located 25 miles east of Aztec and 36 miles east of Farmington, represents the single most popular recreation resource in the immediate study region because of its proximity to the communities of residence and its water-based resources. The reservoir has two developed areas with 145 campsites at Pines and Sims Mesa. Park officials have indicated that for the summer of 1981 the Pines Park was so popular that on peak weekends the park could not accommodate the demand (Findley 1981). A new campground is planned for completion in 1983 to help alleviate the current problems of overcrowding. Water-based recreation activities at the reservoir include swimming, boating, and fishing. The park had over 250,000 visitors in 1980.

Angel Peak, a BLM-developed recreation area, is 13 miles southeast of Bloomfield. The area is called the Nacimiento Badlands; the top 100 feet of Angel Peak, composed of hard sandstone, is the only part of the San Jose Formation remaining in the badlands area. The park has 16 family camping units and picnic units.

Bluewater Lake, more than 100 miles south of the Farmington area, is very popular and is currently experiencing overcrowding on peak weekends. The lake is suitable for boating, fishing, and swimming.

Chaco Culture National Historical Park is a major recreational attraction within the area of influence of NMGS. Visits to the park from 1972 to 1980 increased by 57 percent. Visitation in 1981 totalled 77,000.

The park, administered by the National Park Service, was established in 1980 to "recognize the unique archeological resources associated with the prehistoric Chacoan culture in the San Juan Basin; to provide for the preservation and interpretation of these resources; and to facilitate research activities associated with these resources". Lands were added to what was formerly Chaco Canyon National Monument and outlying sites or "Chaco Culture Archeological Protection Sites" were identified. In addition to the specific mandates contained in the CCNHP, the National Park Service Organic Act (Act of August 25, 1960-16 U.S.C.1) state that the purpose of the NPS "is to preserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

As a consequence of these mandates, Chaco Culture NHP serves as the focus of one of the world's largest and richest archeological districts, preserving spectacular multi-storeyed ruins and other artifacts of the Anasazi period. In addition to the concentration of pueblos and kivas along Chaco Wash, there are a number of

detached units of the park each meriting the same protection as the central portion of the park (Pueblo Pintado, Kin Ya'a, Kin Bineola). It is because of the geographical extent of the park itself and its relationship to the complex of prehistoric roads and the Chaco Culture Archeological Protection Sites (outliers), that CCNHP is sensitive to potential visual intrusions and effects on air quality. To assist visitors in understanding the resources which Chaco has to offer, and to put the achievements of the Chaco people into a comprehensible context, one of the NPS's primary goals is to manage the park unimpaired by activities external to the park to the extent possible. CCNHP is of national and international significance for its cultural, historical, educational, and scenic values.

TRANSPORTATION

The study region encompasses the primary communities of residence for the proposed NMGS project and is physically defined by the major arterials that link the communities and provide access to the proposed NMGS plant site.

REGIONAL TRANSPORTATION

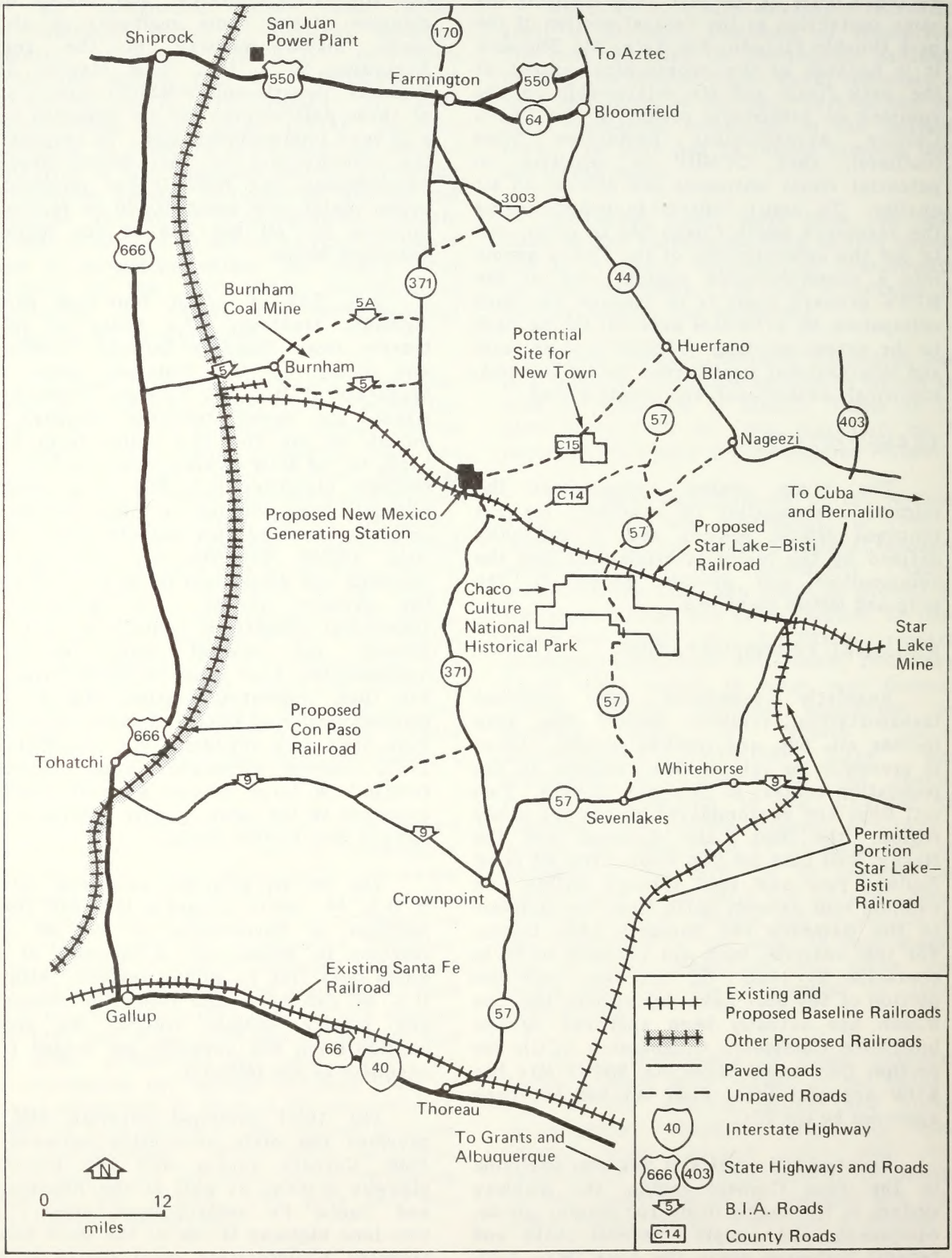
Regularly scheduled and contract transportation services within the area include air, bus, and trucked freight. There is presently no rail service available to the population centers in San Juan County. Two rail lines are contemplated within the study region: the Star Lake Railroad and the Navajo Rail Line (or Con Paso). The AT & SF Railway runs east-west through Gallup. An existing spur extends north from the mainline to the Gamerco and Sampson Lake tracts. For this analysis, both are assumed to be in operation by 1985. Of the two, only the portion of the Star Lake line serving the Lee Ranch has actually been approved by the Interstate Commerce Commission (ICC); the portion that could serve the NMGS site has ROW approval from BLM but has not been approved by the ICC.

Because rail service is not now available to the Four Corners region, the highway system is the major mode for moving goods, equipment, and people. Several state and federal highways serve the area (Map 2-5), but foundation, surface, and safety deficiencies plague some segments of almost every major roadway in the region. According to a 1981 New Mexico State Highway Department (NMSHD) report, some of these deficiencies will be remedied under a 5-year improvement plan. In response to the consequences of past energy resource development, the NMSHD has proposed or begun major new construction or renovation projects for all but one of the highways described below.

U.S. 550, a paved four-lane divided highway, traverses 57.1 miles of rolling terrain from Shiprock through Farmington and Aztec to the Colorado state line. Segments of U.S. 550 between Shiprock and Aztec are paved two-lane highway (2.7 miles), as are the 13.1 miles from Aztec north to the New Mexico-Colorado line. The NMSHD classifies U.S. 550 as a principal arterial that carries a high volume of commuter and service vehicle traffic (e.g., over 10,000 vehicles per day between Shiprock and Bloomfield in 1977). U.S. 550 is the primary access route between the residential population centers of San Juan County and several major employers, including the Four Corners Power Plant, the San Juan Generating Station, and the Utah International coal mine. (Construction of San Juan Unit 4 is scheduled for completion in 1982, thereby eliminating some commuter traffic.) A large volume of coal traffic is expected in the next 3 years, adding to the already high traffic levels.

The second principal east-west arterial is U.S. 64, which connects U.S. 550 from a junction in Farmington to NM 44 at a junction in Bloomfield, a distance of 12.2 miles over flat to rolling terrain. Although U.S. 64 carries a high volume of commuter and service vehicle traffic, its present configuration and capacity are judged to be adequate by the NMSHD.

The third principal arterial, NM 44, provides the main connection between the Four Corners region and the interstate highway system, as well as the Albuquerque and Santa Fe metropolitan areas. This two-lane highway is one of the more heavily traveled noninterstate rural routes in New



Source: Modified from BLM 1982.

Map 2-5. MAJOR TRANSPORTATION ROUTES IN THE SAN JUAN BASIN

Mexico. It is also the primary route to Chaco Culture National Historical Park from both Albuquerque and Farmington. Because of increasing traffic volume, proposed expansions of coal mining activity along NM 44, and its general importance to the Four Corners area, various sections of NM 44 have recently been upgraded; further improvements are scheduled in the near future.

NM 57 and NM 371 combine to provide direct access between Farmington and Interstate 40 at Thoreau. NM 371 is also the main route directly from Farmington to the proposed NMGS plant site, approximately 35 miles south of downtown Farmington. About 40 miles of NM 57/371 are unpaved but graveled; the 66 paved miles are two-lane roadway. A series of construction projects has been proposed by the NMSHD to complete the paving of the total length of two-lane roadway. All remaining dirt and gravel portions of NM 371 have been programmed for construction and should be completed in 1984.

U.S. 666, a major arterial, is the primary north-south route connecting Gallup to Shiprock and the Four Corners area. Covering 90.4 miles of flat to rolling terrain from Interstate 40 to U.S. 550, this highway has four-lane and two-lane segments. At present, U.S 666 is paved along its entire length, and 39 miles of resurfacing and widening projects are in progress to upgrade deficient segments. These projects would also provide for anticipated increased volumes of general traffic and coal-truck movement.

East-west connectors in the study area are also deficient. At present, Navajo 5A connects U.S. 666 and NM 371 from the Burnham Trading Post to 10 miles north of the proposed NMGS site. Approximately half of this road is lightly graded dirt, programmed for bituminous surfacing by 1990. The only other east-west connectors are unimproved county roads (C-15 and C-14) between NM 44 and 371. Current traffic on these narrow, graded dirt roads is estimated to be fewer than 20 vehicles a day. There are no ditches or culverts for roadway drainage, making the roads nearly impassable during inclement weather.

Safety is one of the primary deficiencies of highways in the San Juan-McKinley county network. These two counties ranked in the top three, statewide, for total highway fatalities per million vehicle-miles for the period 1974-1977 (Williams and McAllister 1979). San Juan County reported 60 annual deaths and 2719 total annual accidents for the 3-year period; McKinley County reported 73 annual deaths and 2464 total annual accidents.

Of particular concern to this assessment are accident trends along the primary road to the plant site--NM 57/371 from Thoreau (I-40) north to the Bisti site, and the proposed NM 371 from Farmington south to the site. Since the northern portion of the roadway is still under construction, no data have been collected for this portion of roadway.

For the southern portion from Thoreau to Bisti, the accident trend, consistent with a decrease in traffic volume, has shown a downward shift from 1979 to 1981 (87 total accidents reported for 1979, 73 in 1980, and 64 in 1981). Of the total 224 accidents reported for the 3-year period, 10 were fatal, 77 involved injury, and 137 involved property damage. The most prominent accident types were single roll-overs and collisions with animals (unattended cows and horses).

MUNICIPAL TRANSPORTATION AND TRAFFIC

Farmington

Two federal highways (U.S. 550 and U.S. 64, both principal arterials) feed traffic into the eastern portion of Farmington. Traffic originating locally joins this intercity traffic and is funneled along the Main and Broadway roadways through the central business district to U.S. 550 on the west side of the district. Since none of the major routes bypass the central business district, the combination of commuters and shoppers in the downtown area frequently causes congestion on both the arterials and collectors. Traffic has increased at a rate greater than 5 percent annually on almost every major street in Farmington.

Several major construction, realignment, resurfacing, and improvement projects for Farmington's streets are underway or are

planned for the near future, including an east-west connector between La Plata Highway and East Main at the north of town, and U.S. 64 and Main Street at the east of town. The Old Bloomfield Highway extension, connecting La Plata Highway and U.S. 64, is part of the New Mexico Highway Department's five-year plan. This route would connect eastern residential developments in Farmington with NM 371 and would avoid the main downtown. Traffic accidents in Farmington for 1980 produced 12 fatalities (up 4 from the previous year) and 920 injury accidents (down 492 from the previous year). Accidents at intersections along the two primary east-west corridors totaled 92 along Broadway and 390 along Main Street. Accidents at intersections along Lake Street (the connector with NM 371) were 13 at Broadway and Lake, 9 at Main and Lake, and 9 at Pinyon and Lake. There were 18 accidents at the intersection of Bloomfield Highway and Old Bloomfield Highway.

SOCIAL AND ECONOMIC CONDITIONS

A two-county study region (San Juan and McKinley counties) was initially identified for assessing the potential social and economic impacts resulting from the construction and operation of the NMGS, the water supply system, and that portion of the transmission line system within those counties. A separate assessment was completed that focused only on the transmission line corridors (which therefore included Cibila and Sandoval counties in addition to San Juan and McKinley counties).

Following the initial analysis of the potential project-related social and economic impacts within the two-county study region, a subcounty study area was delineated for detailed analysis. The study area includes all communities that would receive a significant portion of the project-related impacts. For the purposes of this project, the study area encompasses the cities of Farmington, Aztec, and Bloomfield; and the unincorporated communities of Flora Vista, Lee Acres, and the Lower Valley (Waterflow, Fruitland, and Kirtland). The area also includes the eastern portion of the Navajo Reservation and dispersed rural living areas within it.

Communities such as Shiprock, Crownpoint, and Thoreau were excluded from the study area because the results of the preliminary analysis indicated that project-related impacts would be negligible. (See the Social and Economic Conditions Technical Report for additional information.)

POPULATION

The study area contains a multicultural population that is characteristic of northwestern New Mexico. Three broad ethnic groups predominate: Anglos, Native Americans (principally Navajos), and Hispanic-Americans. Since the 1950s the study area has experienced fluctuations in population in response to regional energy exploration and development activities. Between 1985 and 2000, the population of the study area communities is projected to increase by 21.9 percent (rising from 65,650 in 1985 to 80,050 in the year 2000).

ECONOMY AND EMPLOYMENT

Between 1970 and 1980, the major sources of employment in San Juan County were services, wholesale and retail trade, and government. The majority of those jobs were located in the study area. During this period, total county employment increased by more than 17,800 jobs. The largest increases were exhibited by the county's largest employment sectors: services, contract construction, wholesale and retail trade, and mining. Over the next 20 years the economy in the study area is expected to continue to be relatively dependent upon energy resource development. It is anticipated that much of the growth during this period would result from the expansion of coal mining and associated coal-haul railroad operations.

PUBLIC FINANCES

During the 1980-81 fiscal year (FY), the City of Farmington's total revenues were nearly $74.2 million and expenditures approached $51.4 million. The city had moderate surpluses in operating and enterprise funds, and a large surplus in the capital budget, which resulted mainly from the sale of $23.6 million in bonds. The city

is expected to continue to generate substantial annual surpluses in the general fund between 1981 and 2000.

The City of Aztec also experienced a net surplus in FY 1981. Revenues were $3.4 million and expenditures were $3.2 million. The general fund surplus is expected to continue through FY 2000.

The City of Bloomfield had a slight deficit of approximately $62,000 in FY 1981, when revenues were $1.75 million and expenditures were $1.81 million. It is anticipated that the city could experience deficits in its operating budget throughout the rest of the century, ranging from $100,000 to $120,000 annually.

San Juan County's overall budget showed a deficit of over $400,000 in FY 1981. Total revenues were $13.2 million and expenditures were $13.6 million. It is expected that, because of its property tax base, the county's operating budget could exhibit a significant surplus during the next 20 years.

The Farmington Municipal School District received $18.0 million in revenues and spent $17.6 million in the 1980-81 school year. The district is expected to maintain an annual surplus of about $750,000 for noncapital funds through the year 2000.

During the 1980-81 school year, the Aztec Municipal School District experienced a slight budgetary surplus of $130,000. Revenues were $11.0 million and expenses were approximately $10.9 million. Aztec Municipal Schools are projected to have a small annual deficit (about $30,000) for noncapital funds through the year 2000.

Bloomfield Municipal School District's revenues for 1980-81 were $14.5 million, compared to expenditures of $9.1 million. During that year the district sold $5.2 million in bonds for school construction. Like the Aztec School District, Bloomfield has a relatively large property tax base to support a high level of operational expenses per pupil. The School District is expected to show an annual surplus of at least $880,000 per year in noncapital funds through the year 2000. The Central Consolidated School District had revenues of $16.8 million and expenditures of $16.1 million in 1980-81.

HOUSING

The 1980 census indicated a total housing stock of 29,730 in San Juan County. The majority of these housing units are located in the study area communities. Between 1970 and 1981, the number of housing units in the study area more than doubled. During the same time period, the proportion of mobile homes and multifamily housing units increased, while the proportion of single-family detached units decreased.

While preliminary 1980 census data indicated a housing vacancy rate of 11.1 percent in Farmington, and up to 15 percent in some rural areas, local planners estimate much lower rates of around 2-3 percent. From projections of future development, without the Proposed Action, demand for housing is expected to increase fairly steadily from 1985 through the year 2000, with only occasional decreases in demand occurring in the study area.

Vacant residential land exists in the study area in sufficient quantities to accommodate the projected growth in housing demand. Moreover, the annual increases in housing demand projected for the study area are moderate compared with the 726-unit average annual addition to the housing stock in Farmington, Aztec, and Bloomfield between 1970 and 1981. However, if current high interest rates persist, it is probable that few additions to the supply of conventional single-family and multifamily housing would be made. This, combined with current low vacancy rates, could result in a shortage of those housing types, which could persist into the mid- to late 1980s.

MUNICIPAL SERVICES

An examination of the water supply systems in the study area indicated that peak day use for systems in Farmington, Aztec, and Bloomfield would remain below projected treatment capacities through the year 2000, although additional water rights would have to be purchased by each of those

municipalities to meet projected demand. With recent and planned system improvements, Farmington would have the capacity to treat wastewater through 1989 and Aztec and Bloomfield would have capacities to meet needs beyond the year 2000. Landfill sites identified for solid-waste disposal would be able to meet the area's needs for an estimated 15 years.

EDUCATION

Farmington Municipal School District facilities are currently overcrowded. Construction of new facilities has been prevented because recent school bond proposals have been rejected by local voters. At present, 44 portable classrooms are in use, and more must be purchased to accommodate the substantial projected growth in enrollment. For example, without the Proposed Action, it is estimated that enrollment would increase annually between 1985-86 and 1989-90, fluctuate into 1992-93, and rise during the remainder of the decade, resulting in an overall increase of approximately 2000 students. Farmington would continue to experience severe shortages of permanent facilities unless funds are obtained for new construction.

Aztec Municipal School District facilities had excess capacities in 1980-81, and a new high school is scheduled for construction in 1985. Schools in Bloomfield and in the Lower Valley area are operating close to capacity. A new elementary school is under construction in Bloomfield, and new facilities could be needed in Lower Valley as early as 1985.

Increased enrollments are projected for each of the above school districts through the year 2000, which would necessitate further staffing and facility expansions. However, Farmington is the only school district that was facing an acute facility shortage in 1980-81 as a result of difficulties in raising funds for necessary expansions.

HUMAN SERVICES

Human service agencies in San Juan County were operating at or near capacity in 1981. Increased demand for human services is anticipated in the 1980s, but the outlook for funding, especially for federal programs, is uncertain.

TRADITIONAL VALUES AND LIFESTYLES

Because Native Americans in the study region are workers, consumers of goods and services, and users of community facilities and services, they represent a substantial part of the larger community described in the assessment of social and economic conditions above. (For example, approximately 35 percent of the total San Juan County population is Native American [primarily Navajo]. In 1980, approximately 19,900 Native Americans were living in the "checkerboard area" adjacent to the Navajo Reservation.) The traditional values and lifestyles maintained by Navajos in the study region, however, are in some cases substantially different from those maintained by Anglo- and Hispanic-Americans in the region. An attempt was made, therefore, to evaluate traditional Navajo values and lifestyles in order to understand how the Proposed Action would potentially affect them. Information on the proportion of potentially affected Navajos who maintain traditional values and lifestyles was not available for this study. It was necessary, therefore, to qualify rather than to quantify statements regarding traditional values and lifestyles. In addition, it was assumed that at least some of the Navajos potentially affected by the Proposed Action do adhere to traditional values and lifestyles.

Navajo lifestyles and values today are widely diverse because of different levels of exposure and adaptation to other culture systems. Rapid population growth, depletion of the renewable resource base, increasing energy resource exploration, and development on lands traditionally occupied or used by Navajos, as well as better access to educational and employment opportunities in nontraditional settings, have contributed to increased acculturation.

It is impossible to document how many Native Americans in the affected environment still adhere to traditional values and lifestyles. Some individuals are highly acculturated and support continued energy

resource development and expansion of the local economy in nontraditional ways. Others protest continued development because it violates some traditional beliefs and values. Most Navajos are attempting to adapt their lifestyles to accommodate participation in the national wage economy while adhering to their traditional cultural values to the greatest extent possible. While a considerable amount of change in Navajo culture has occurred over the past few decades, the integrity of the Navajo culture core has been maintained. Elements such as the clan system, matrilineal descent, matrilocal residence patterns, extended-family cooperation, and traditional beliefs and values are still widely observed. While traditional Navajos today are much more mobile than their ancestors, they still have a strong sense of kinship networks. Even those who leave their "home" communities to work in urban areas return home frequently, and they provide support to relatives who follow more traditional economic pursuits, such as livestock grazing.

WATER SUPPLY SYSTEM

PROPOSED ACTION (35,000 Ac-Ft/Yr from the Navajo Reservoir [San Juan River])

HYDROLOGY

The geographic areas of influence for the Proposed Action were defined as (1) direct impacts, San Juan River; and (2) indirect effects, Colorado River. The San Juan River originates in southwestern Colorado and flows through northwestern New Mexico before leaving the state in the Four Corners area (Map 2-2). The San Juan River is tributary to the Colorado River at Lake Powell, Utah.

The Navajo Reservoir is the principal surface-water impoundment in the San Juan Basin. The Bureau of Reclamation has storage rights in Navajo Reservoir and would use those rights to supply the Navajo Indian Irrigation Project and other contracted water users, including the water supply proposed for NMGS. Additional reservoirs are planned as part of the Animas-La Plata project, which will have a effect on tributary inflows to the San Juan River in the vicinity of Farmington (Map 2-2).

Principal uses of water from the San Juan River and its tributaries are for irrigation, industrial supply (including power plant cooling), and municipal supply.

The average annual discharge (flow) of the San Juan River at Farmington has been about 2400 cubic feet per second (cfs). The average discharge of the San Juan River at Farmington that might be expected during a severe drought is about 700 cfs (average streamflow during 51-month critical period simulated in Bureau of Reclamation operations studies).

The availability of water from the San Juan River for uses in New Mexico is dependent on the physical supply and on institutional limitations. In operation studies of the San Juan River system, the Bureau of Reclamation estimated the physical availability of the supply upstream of Shiprock, New Mexico, to be 705,000 ac-ft/yr during a critical drought period. Estimates of the availability of water based on the institutional limitations of the Colorado River Compact, Upper Colorado River Basin Compact, and Mexican Treaty of 1944 are 647,000 ac-ft/yr (Bureau of Reclamation) and 727,000 ac-ft/yr (New Mexico Interstate Stream Commission). In order to avoid making a critical interpretation of the Colorado River Compact, the Bureau of Reclamation has made the conservative assumption for planning purposes that the Upper Basin states can deplete the flow of the Colorado River at Lee Ferry by 5.8 million ac-ft/yr. Based on that assumption, the Bureau of Reclamation has conservatively assumed that New Mexico's share would be 647,000 ac-ft/yr.

WATER QUALITY

In general, the quality of water in the San Juan River between Bloomfield and Shiprock is good enough to protect the beneficial uses of the river in this reach. Designated uses of this part of the river include industrial water supply, irrigation, livestock and wildlife water supply, secondary contact recreation, marginal cold-water fishery, and warm-water fishery (New Mexico Water Quality Control Commission 1981). Designated uses below Shiprock are similar. Tributary inputs to the

San Juan River in this area tend to degrade its quality. Consequently, levels of total dissolved solids (TDS) increase in the downstream direction (time-weighted average TDS of 266 mg/l at Bloomfield versus 449 mg/l at Shiprock). Both the composition and concentrations of dissolved solids in the San Juan River vary with flow. TDS concentrations tend to increase as flow decreases. Chemical composition generally shifts also; calcium carbonate dominates during high flow periods, and calcium sulfate dominates during medium and low flow periods. Concentrations of trace elements, iron, and manganese are high, although most of the trace elements are associated with suspended matter. Suspended sediment concentrations are also very high.

ALTERNATIVE 1 (20,000 Ac-Ft/Yr from the San Juan River plus 15,000 Ac-Ft/Yr Ground Water)

HYDROLOGY

The geographic areas of influence for the alternative water supply were defined as (1) direct impacts: Westwater Canyon Member aquifer system in the San Juan Basin, San Juan River, Puerco River, Rio San Jose, Rio Salado (tributary of Jemez River), and springs in the Chuska Mountains near Crystal, New Mexico; and (2) indirect effects: areas fed by springs in Chuska Mountains.

The Westwater Canyon Member aquifer system is extensive throughout the San Juan Structural Basin; it consists of three aquifers (Dakota Sandstone, Westwater Canyon Member of the Morrison Formation, and Entrada Sandstone) and two confining layers (Map 2-6). The confining layers consist of the geologic units between the Dakota Sandstone and Westwater Canyon Member and between the Westwater Canyon Member and the Entrada Sandstone and are generally composed of rock types with relatively low permeability.

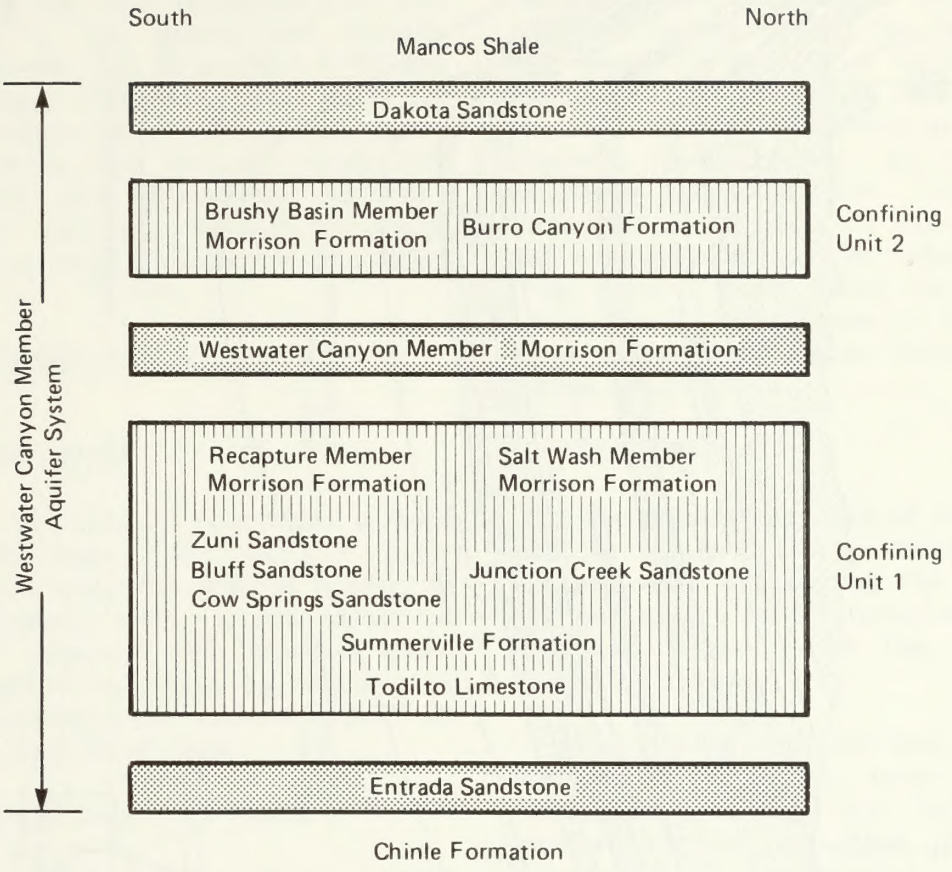
The aquifers are confined, except in outcrop areas around the margins of the basin where recharge takes place. As is characteristic of confined aquifers, water levels in wells that tap these aquifers are above the top of the aquifers. A number of wells that are completed in the Westwater Canyon Member are flowing. The depth to these aquifers throughout the San Juan Structural Basin is a function of location; the aquifers dip gently from the outcrop areas toward the center of the basin, where they may lie more than 5000 feet below the ground surface (Map 2-7). Discharge from the Westwater Canyon Member aquifer system takes place from pumping of wells and from contributions to surface and subsurface flow in the Puerco River, San Juan River, Rio San Jose, Rio Puerco, and Rio Salado.

Springs emerge from the Chuska Sandstone where it overlies the Westwater Canyon Member in the vicinity of Crystal, New Mexico (Chuska Mountains). This area probably is a recharge area for the Westwater Canyon Member aquifer system.

The principal use of ground water from the Westwater Canyon Member aquifer system has been the dewatering of uranium mines. Other present and projected uses are domestic and community water supply, livestock watering, mining and milling, mine reclamation, and power plant cooling.

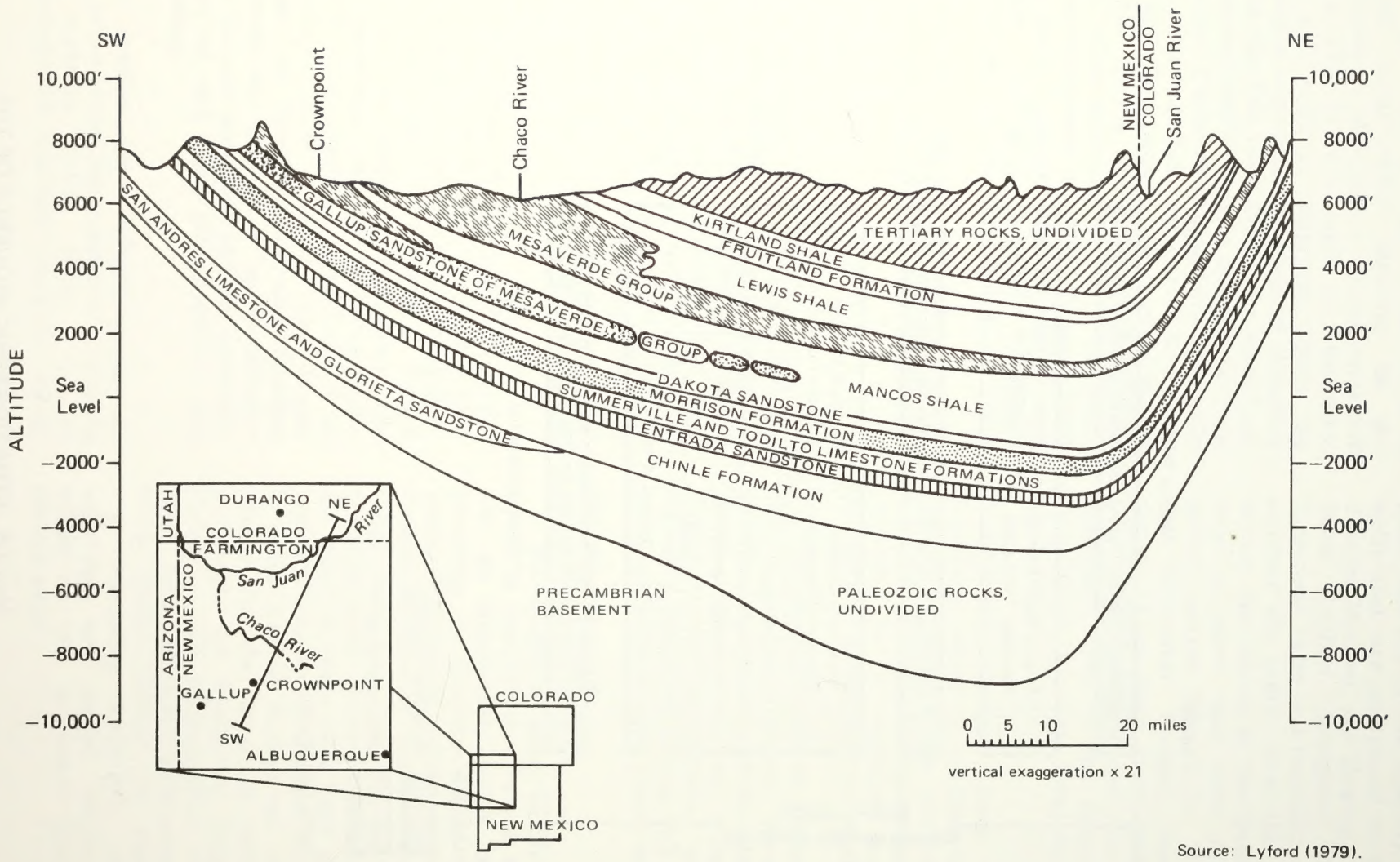
WATER QUALITY

The quality of water in the aquifers that would be used for or affected by withdrawal for an alternative water supply varies according to location within the San Juan Basin. TDS concentrations in the Westwater Canyon Member of the Morrison Formation range from less than 500 mg/l in or near recharge areas in the southwestern part of the basin to more than 4000 mg/l near the center of the basin. Analysis of ground water from the Apache Foshay test well (the well nearest to the proposed well field that penetrates the Westwater Canyon Member) yielded a TDS concentration of about 4500 mg/l. Water from this well generally exceeds water quality criteria for most beneficial uses (including irrigation and livestock watering) and would require treatment before its use as boiler feed-water and cooling water.



Note: Not to scale

Map 2-6. STRATIGRAPHIC SEQUENCE OF THE WESTWATER CANYON MEMBER AQUIFER SYSTEM



Source: Lyford (1979).

Map 2-7. GENERALIZED GEOLOGIC SECTION SHOWING MAJOR AQUIFERS (PATTERNS) IN THE SAN JUAN BASIN

The water quality in the Dakota and Entrada sandstones is generally poorer than that found in the Westwater Canyon Member, but it generally follows the same trends within the San Juan Basin (i.e., TDS concentrations generally increase with distance from the southern outcrop of the formations). Analysis of water from the Apache Foshay test well indicated that TDS concentrations in the Dakota and Entrada sandstones near the site were about 6,000 and 15,000 mg/l, respectively. As with the water from the Westwater Canyon Member, water from the Dakota and Entrada sandstones would generally not be suitable for most beneficial uses and would require treatment before its use as boiler feedwater or cooling water.

PROPOSED INTAKE STRUCTURE AND PIPELINE P1

MINERAL RESOURCES

Extensive deposits of gravel are present along the San Juan River and its major tributaries, in or near the general vicinity in which the proposed water intake would be located. The proposed P1 pipeline route would cross areas underlain by deposits of coal (approximately from mileposts [MP] 30 to 35) oil, gas, and baked shale.

PALEONTOLOGICAL RESOURCES

The proposed P1 pipeline route crosses paleontologically sensitive formations along its entire length but is generally located 10 to 15 miles away from important scientific fossil localities. The only exception to this is near the Bisti Trading Post, in a locality where 17 fossils, including some significant specimens, have been reported from the Fruitland Formation (mileposts 31-33).

SOILS

Table 2-8 summarizes those aspects of the existing soils environment that may contribute to reclamation problems along the proposed P1 pipeline route and intake. Soils along the route are generally not very productive because of low available moisture, low organic content, and undesirable physical and chemical characteristics.

The surface facilities associated with the proposed P1 pipeline (including intake) would not be located on prime or unique farmland.

HYDROLOGY

Both the Proposed Action and Alternative intake locations are within the 100-year floodplain of the San Juan River (see Maps G1 and G2 of Hydrology TR). A peak discharge of 20,000 cfs has been used (by the Corps of Engineers and New Mexico Highway Department) as the 100-year discharge in the San Juan River at Farmington, upstream of the Animas River, and at Bloomfield. This value is much less than historic flood flows on the San Juan River, because regulation of flood waters by Navajo Dam will occur under present and future conditions.

VEGETATION

The geographic area of influence for P1 and the proposed intake structure includes a 90-foot-wide area along the pipeline route and the area directly disturbed by construction and operation of the intake facility (including access).

The intake location and the floodplain surrounding it differ from other project components in that the location supports riparian vegetation (Map 2-8). Riparian vegetation is considered an important resource in the region because the type is limited and constitutes less than 1 percent of the regional vegetation. The proposed intake location is on the southern bank of the San Juan River near Farmington. This site is on an old floodplain about 10 to 20 feet above the average river level. The river has cut into this elevated bank, thus leaving a very narrow zone of subirrigated, and occasionally flooded, land at an elevation that supports riparian vegetation. This band is about 30 feet wide and is occupied by the mixed riparian scrub type, predominantly Russian olive. Uphill and behind it, most of the site is shrub-grass vegetation.

WILDLIFE

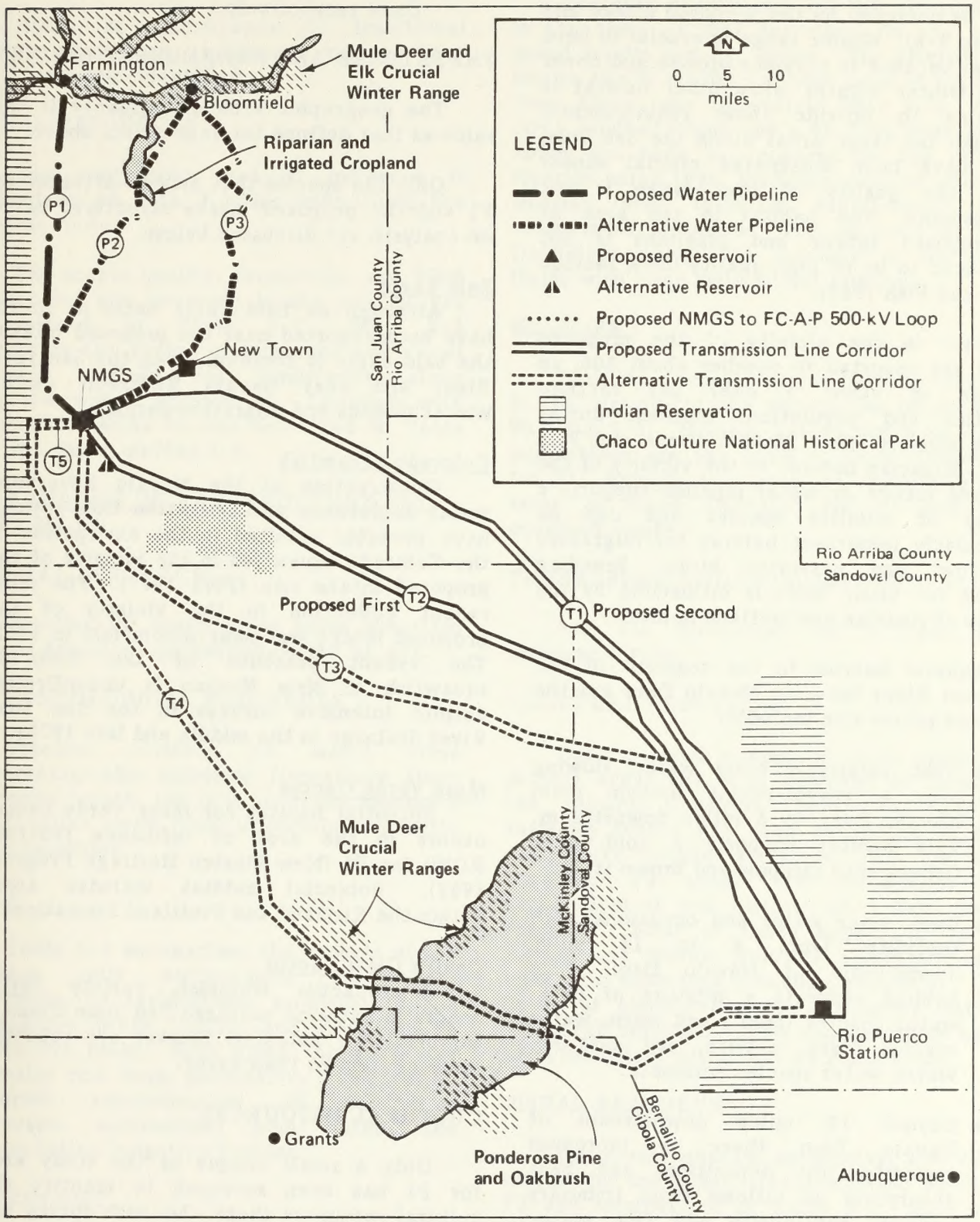
The geographic area of influence is the same as that defined for vegetation, above.

Table 2-8. SUMMARY OF POTENTIAL SOILS RECLAMATION PROBLEM AREAS FOR THE WATER SUPPLY SYSTEM[a]

Project Component	Indicators of Potential Reclamation Problems: High Wind Erosion Susceptibility (% of total)	High Water Erosion Susceptibility (% of total)	Steep Terrain (% of total)
Main Water Pipeline			
P1	31.7 miles[b] (79.8%)	1.6 miles (4%)	1.35 miles (3.4%)
P2	28.4 miles[b] (66.7%)	2.6 miles (6.1%)	2.0 miles (4.7%)
P3	34.0 miles[b] (70%)	3.6 miles (7.4%)	2.3 miles (4.7%)
Terminal Storage Reservoir			
Proposed	35 acres	--	--
Alternative	--	4 acres	--

[a]See Table 10 in the Soils and Prime and Unique Farmlands Technical Report for a listing of potential reclamation problem areas by map unit or soil association and mileposts or acreage (including pertinent comments and potential mitigation measures). Table 10 also lists (or refers to) data sources, and the approach and criteria used in the compilation of this table.

[b]Each mile traversed corresponds to about 10.9 acres of the pipeline construction ROW.



Source: BLM 1982.

Map 2-8. AREAS OF CRUCIAL WILDLIFE HABITAT AND UNIQUE VEGETATION

Mule deer crucial winter range is located along the San Juan River in the area that would be occupied by the proposed intake and P1 (Map 2-8). Winter range is crucial to herd survival because it provides browse and cover during winter months when other habitat is not able to provide these requirements. Although the large areas along the San Juan River have been designated crucial winter range, the quality of that range is not homogeneous. The habitat in the area of the proposed intake and pipelines is not considered to be of high quality (New Mexico Game and Fish 1982).

Deer in the vicinity of the proposed intake are reported to number about 300, an average of about 1 deer per section. Densities and populations increase during severe winters (New Mexico Game and Fish 1982). Riparian habitat in the vicinity of the proposed intake or water pipeline supports a variety of wildlife species and can be particularly important habitat for migratory waterfowl and passerine birds. Breeding success for many birds is influenced by the quality of riparian and wetland habitat.

Aquatic habitat in the segment of the San Juan River between Navajo Dam and the proposed intake site includes:

- Cold, relatively clear water, flowing over a gravel-rubble bottom from Navajo Dam to 8 miles downstream. This habitat supports a cold-water fishery with rainbow and brown trout.

- Cool, clear water and occasional high turbidity from 8 to 18 miles downstream of Navajo Dam. This habitat supports a mixture of cold-water species (trout) and warm-water species (carp, catfish, and suckers). Warm-water species dominate.

- Beyond 18 miles downstream of Navajo Dam there is increased turbidity, silt deposition, and heat absorption as inflows from tributary canyons continually add fine materials. This habitat supports a warm-water fishery with carp, catfish, and suckers. (The proposed and alternative intakes would be located in this stretch of river, approximately 20 and 30 miles downstream of the Navajo Dam, respectively.)

THREATENED AND ENDANGERED SPECIES

The geographic area of influence is the same as that defined for vegetation, above.

Only the species that may be affected by P1 and the proposed intake structure, based on analysis, are discussed below.

Bald Eagle

Although no bald eagle nests or roosts have been reported near the proposed intake, the bald eagle is common along the San Juan River and near Navajo Reservoir during winter months and migration periods.

Colorado Squawfish

Construction of the Navajo Reservoir, water depletions, and irrigation flow returns have probably resulted in the extirpation of the Colorado squawfish in the vicinity of the proposed intake site (FWS 1977). The most recent collection in the vicinity of the proposed intake was near Bloomfield in 1965. The recent presence of the Colorado squawfish in New Mexico is unconfirmed, despite intensive surveys in the San Juan River drainage in the middle and late 1970s.

Mesa Verde Cactus

Potential habitat for Mesa Verde cactus occurs in the area of influence (90-foot ROW) for P1 (New Mexico Heritage Program 1982). Potential habitat includes areas within the Kirtland and Fruitland formations.

Devil's Claw Cactus

Sclerocactus whipplei, variety heilli, occurs in extreme northern San Juan County. No plants or potential habitat are reported south of the San Juan River.

CULTURAL RESOURCES

Only a small sample of the study area for P1 has been surveyed to identify the cultural resources there. No such survey has been conducted at the proposed intake structure site. In the surveyed localities, 71 archaeological and historic sites have been recorded. Most of these appear to be of

Archaic or Navajo cultural affiliation; none are protected Chacoan resources.

Areas of significance to traditional Native American religious values have previously been identified.

VISUAL RESOURCES

The geographic area of influence is defined as an area 3 miles wide along the pipeline route.

The scenic quality, sensitivity, and VRM classes for the proposed intake and P1 are summarized in Table 2-7. Map 2-3 illustrates the region of influence and visual resource ratings for landscapes along proposed water pipeline P1. Location with respect to WSAs is also described in Table 2-7 and shown on Map 2-3.

ALTERNATIVE INTAKE STRUCTURE AND PIPELINE P2

MINERAL RESOURCES

Pipeline P2 would cross areas underlain by coal deposits (approximately MP 32-37).

PALEONTOLOGICAL RESOURCES

Pipeline corridor P2 would cross paleontologically sensitive formations along its entire length, but it is generally located 5 to 10 miles away from important scientific fossil localities.

SOILS

Table 2-8 summarizes the aspects of the existing soils environment that may contribute to reclamation problems at the alternative intake facility and along the P2 alternative route. Soils along this route are generally not very productive, although P2 traverses approximately 10 miles of productive agricultural land within the Navajo Indian Irrigation Project.

HYDROLOGY

See the hydrology discussion for the Proposed Action, above.

VEGETATION

The area of influence for this alternative is the same as that described for the proposed intake and P1, above. The alternative intake site is on the southern bank of the San Juan River near Bloomfield (Map 2-8). The large sandbar island and a 60-foot-wide zone along the bank are covered by the mixed riparian scrub type, including sandbar willow, Russian olive, tamarisk, rabbit-brush, and cottonwood seedlings. The majority of the floodplain above the cutbank is irrigated fields with large isolated cottonwoods.

WILDLIFE

Mule deer crucial winter range is located in the vicinity of the alternative intake and P2 (Map 2-8). Habitat quality and mule deer populations are the same as those discussed for P1. Aquatic resources are essentially the same as those discussed for P1 and the proposed intake.

THREATENED AND ENDANGERED SPECIES

See the discussion for P1 and the proposed intake.

CULTURAL RESOURCES

Only a small sample of these proposed project areas has been surveyed to identify the cultural resources there. No cultural resource survey has been conducted at the alternative intake structure site. In the surveyed P2 study area localities, 79 archaeological and historic sites have been recorded. Most of these appear to be of Archaic or Navajo cultural affiliation, and none are protected Chacoan resources. No areas of significance to traditional Native American religious values and practices have been identified within the P2 study area.

VISUAL RESOURCES

The scenic quality, sensitivity, and VRM classes for the alternative intake and pipeline P2 are summarized in Table 2-7. Map 2-3 illustrates the region of influence and visual resource ratings for landscapes along alternative water pipeline P2 and the

alternative intake. Location with respect to WSAs is also described in Table 2-7 and shown on Map 2-3.

ALTERNATIVE INTAKE STRUCTURE AND PIPELINE P3

GEOLOGIC SETTING

Steep-sided slopes and landslide potential exist along P3 in Kutz Canyon near Bloomfield.

MINERAL RESOURCES

Pipeline P3 would cross areas underlain by coal deposits (MP 41.5-46.0).

PALEONTOLOGICAL RESOURCES

The P3 corridor would cross exposures of the Nacimiento Formation in Kutz Canyon that have yielded a rich assemblage of significant fossils, including some of the earliest known primates. This area is classified as having high paleontological sensitivity. Kutz Canyon is currently a focal point of important paleontological research. The remainder of the proposed P3 route (60 percent) crosses areas of moderate paleontological sensitivity.

SOILS

Table 2-8 summarizes those aspects of the existing soils environment that may contribute to reclamation problems along P3.

WILDLIFE

Mule deer crucial winter range is located in the San Juan River valley in the vicinity of the alternative intake and P3 (Map 2-8). Habitat quality and mule deer populations are the same as those discussed for P1.

THREATENED AND ENDANGERED SPECIES

See the discussion for P1.

CULTURAL RESOURCES

In the surveyed P3 study area localities, 64 archaeological and historic sites have been recorded. Most of these appear to be of Archaic or Navajo cultural affiliation. Some are of significance in Anasazi-Chacoan studies. The proposed P3 study area crosses the prehistoric Chacoan Great North Road twice, and also includes the Twin Angels (or Kutz Canyon) site that is an Archaeological Protection Site designated by the Chaco Culture Preservation Act. No sites of traditional Native American importance have been identified in the P3 study area.

VISUAL RESOURCES

The scenic quality, sensitivity, and VRM classes for the P3 route are summarized in Table 2-7.

PROPOSED TERMINAL STORAGE RESERVOIR

SOILS

Table 2-8 summarizes those aspects of the existing soils environment that may contribute to reclamation problems at the proposed terminal storage reservoir site (R1).

The proposed reservoir site does not contain any prime or unique farmland.

ALTERNATIVE TERMINAL STORAGE RESERVOIR

See the discussion for the proposed reservoir, above.

TRANSMISSION SYSTEM

PROPOSED TRANSMISSION LINE T1

GEOLOGIC SETTING

Proposed transmission line T1 would cross the Rio Puerco Fault Belt near the Rio Puerco Station (see the Geologic Setting Technical Report). One or more active fault traces are probably present.

MINERAL RESOURCES

T1 would cross strippable coal deposits and baked shale in the Bisti Fruitland (approximately MP 0-4.5), Star Lake Fruitland (approximately MP 53.559), and La Ventana Mesaverde (approximately MP

75.0-77.5) coal areas. Route T1 would also cross several uranium prospects.

PALEONTOLOGICAL RESOURCES

T1 would cross approximately 50 miles of intermittent exposure of the Nacimiento Formation. These exposures have been the subject of paleontological study for nearly 70 years, are of current research interest, and have yielded large numbers of significant fossils. T1 passes directly across or within 1 mile of a number of important localities, including the famous Mammalon Hill and Kimbeto sites.

SOILS

Table 2-9 summarizes those aspects of the existing soils environment that may contribute to reclamation problems for the T1 route. Soils along the route are generally not very productive because of low available moisture, low organic content, and undesirable physical and chemical characteristics.

The surface facilities associated with T1 would not be located on prime or unique farmland.

WILDLIFE

The geographic area of influence was defined as an area 200 feet wide along all proposed and alternative transmission line routes.

Wildlife resources in the geographic area of influence for T1 are similar to those described for the plant site. Locations of raptor nests and general discussions for other wildlife species are provided in the Wildlife and Aquatic Biology Technical Report.

CULTURAL RESOURCES

A moderate portion of the T1 study area has been surveyed to identify the cultural resources there. In the surveyed localities, 164 archaeological and historic resources have been recorded. Most of these appear to be of Navajo or Anasazi cultural affiliation; Archaic materials are also identified there. The T1 study area crosses the prehistoric Chacoan Great North Road and is immediately adjacent to Pierre's site, a protected Chacoan site. In addition, the study area includes at least 5 resources of traditional Native American value: the Great North Road, an antelope corral, a spring, and 2 ceremonial sites.

VISUAL RESOURCES

The geographic area of influence was defined as 5 miles on each side of all proposed and alternative transmission line routes.

The scenic quality, sensitivity, and VRM classes for T1 are summarized in Table 2-7. Map 2-3 illustrates the region of influence and visual resource ratings for landscapes along T1.

WILDERNESS VALUES

The Ojito WSA is located approximately 5 miles southwest of the village of San Ysidero in T15N, R1W and R1E. The T1 study area encompasses the far western portion of the Ojito WSA.

This 11,200-acre WSA consists of steep and rocky terrain cut by several steep canyons. It is bounded on the north by property boundaries, on the west by a powerline ROW, on the south by a combination of county-maintained road and gas pipeline ROW, and on the east by a combination of maintained road and ridgeline.

Several earthen dams are well buffered by the steep and rocky terrain, thus leaving these intrusions substantially unnoticeable. There is no external intrusion at this WSA.

The combination of the rocky, rugged terrain and few intrusions provides the opportunity for solitude. Outstanding opportunities for primitive and unconfined types of recreation also exist.

Supplemental values are provided by the abundance of prehistoric and historic sites and paleontological resources, as well as high-quality scenic values.

PROPOSED TRANSMISSION LINE T2

PALEONTOLOGICAL RESOURCES

The northwestern half of T2 lies very near the irregularly shaped lower boundary

Table 2-9. SUMMARY OF POTENTIAL SOILS RECLAMATION PROBLEM AREAS IN TRANSMISSION LINE STUDY AREAS[a]

	Indicators of Potential Reclamation Problems		
	High Wind Erosion Susceptibility (% of total)	High Water Erosion Susceptibility (% of total)	Steep Terrain (% of total)
Transmission Line Study Areas			
T1	56.6 miles[b] (52.4%)	23.5 miles (21.8%)	--
T2	37.3 miles (36.9%)	32.0 miles (31.7%)	--
T3	47.0 miles (44.3%)	22.75 miles (21.5%)	--
T4	50.0 miles (40.3%)	23.25 miles (18.8%)	8.75 miles (7.1%)
T5	5.0 miles (100%)	--	--

[a]See Table 10 in the Soils and Prime and Unique Farmlands Technical Report for a listing of potential reclamation problem areas by soil association and mileposts (including pertinent comments and potential mitigation measures). Table 10 also lists (or refers to) data sources, and the approach and criteria used in the compilation of this table.

[b]Each mile traversed corresponds to about 24.2 acres of the transmission line construction ROW.

of the Fruitland Formation, where it intermittently crosses Fruitland exposures. Near the proposed plant site the route crosses about 1 mile of Fruitland Formation where no fossil occurrences have been reported, but where adjacent distributions indicate that such occurrences are somewhat likely. Approximately 25 miles of T2 cross more or less continuously over the Fruitland Formation, from lands mapped on the Fire Rock Well USGS topographic sheet quadrangle into those of the Star Lake USGS sheet. A number of occurrences have been reported in or within 1 mile of T2, although they include few significant fossils. Over the rest of its length, T2 passes over areas of low paleontological sensitivity.

SOILS

Table 2-9 summarizes those aspects of the existing soils environment that may contribute to reclamation problems for the T2 route. Soils are generally not very productive, as discussed for T1.

THREATENED AND ENDANGERED SPECIES

The geographic area of influence was defined as an area 200 feet wide along all proposed and alternative transmission line routes.

Black-footed Ferret

The last black-footed ferret collected in the area of proposed project components (McKinley County) was in 1940. No reliable sightings have been recorded in recent years. Recent surveys have also failed to record any verified sightings or collections. Potential black-footed ferret habitat (prairie dog towns) is limited to several locations along T2 (MP 0-10, MP 30-40).

CULTURAL RESOURCES

A relatively small portion of the T2 study area has been surveyed to identify the cultural resources there. In the surveyed localities, 73 archaeological and historic resources have been recorded. Most of these appear to be of Navajo affiliation, although there are a few significant Anasazi resources there. The T2 area of influence crosses and is immediately adjacent to, or even coincident with, the Northern Addition and Pueblo Pintado elements of Chaco Culture National Historical Park. Three Chacoan outlier sites (Greasy Hill, Escavada Complex, Kin Indian Ruins) not within the park or having special protection status, but recommended by the State Historic Preservation Officer to be eligible for the National Register of Historic Places, are within or adjacent to the T2 study area. The Raton Well protection site is within a mile of that study area, and the proposed T2 corridor also crosses preliminary identified Chacoan roads or road spurs. In addition, at least 3 sites important to traditional Native American values have been identified within the T2 study area: the Black Lake offering point, a sacred canyon, and a plant gathering area.

VISUAL RESOURCES

The scenic quality, sensitivity, and VRM classes for T2 are summarized in Table 2-7. Map 2-3 illustrates the region of influence and visual resource ratings for landscapes along T2. The corridor would border at one point the northern perimeter of CCNHP.

WILDERNESS VALUES

The Cabezon WSA is located approximately 15 air miles due west of San Ysidro, in T16N, R3W and R2W; and T15N, R2W. The Cabezon WSA is 7235 acres and consists of a volcanic plug 8000 feet high that is surrounded by rolling hills cut by a network of arroyos. The T2 area of influence overlaps the eastern portion of this WSA between mileposts 75 and 80. The eastern boundary is currently bounded by a powerline ROW (NM559354) and an unimproved dirt road.

The unique geology of the Cabezon WSA provides an outstanding opportunity for those who choose to climb the peak itself or wander among the foothills. The peak provides a topographic buffer that allows users to avoid the sights and sounds of others. It also offers an excellent panoramic view, unavailable from other perspectives, of surrounding landscapes.

Cabezon offers the opportunity for primitive and unconfined recreation. The area offers an opportunity for sightseeing and photography related to scenic, geologic,

and cultural values. Cabezon is a unique geologic feature and has two prehistoric shrines on top of the peak; thus Cabezon also offers educational and scientific supplemental values.

ALTERNATIVE TRANSMISSION LINE T3

MINERAL RESOURCES

T3 would cross strippable coal deposits and baked shale in the Chaco Canyon Upper Menefee (approximately MP 2.5-4.5) and Bisti Fruitland (approximately MP 0-2.5) coal areas.

PALEONTOLOGICAL RESOURCES

T3 would cross about 1 mile of the Fruitland Formation immediately south of the proposed plant site. Two nonsignificant fossil occurrences have been reported there. The remainder of T3 would cross regions of low paleontological sensitivity.

SOILS

Table 2-9 summarizes those aspects of the existing soils environment that may contribute to soil reclamation problems for the T3 route. Soils are generally not very productive, as discussed for T1 and T2.

THREATENED AND ENDANGERED SPECIES

Black-footed Ferret

Potential black-footed ferret habitat (prairie dog towns) is limited to one area on T3 (MP 0-10).

CULTURAL RESOURCES

A relatively small sample of the study area for T3 has ben surveyed to identify the cultural resources there. In the surveyed localities, 51 archaeological and historic resources have been recorded. Two of these appear to be Paleo-Indian sites, while the rest are generally of either Archaic, Anasazi, or Navajo cultural affiliation. The Chacoan outlier Casa Patricio, presumed eligible for the National Register of Historic Places, is within the T3 study area, and that unit also crosses 4 possible Chacoan roads. Kin Bineola (detached unit of CCNHP) and Lake Valley and Upper Kin Klizhin (Chaco Culture Archeological Protection sites) are located within 500 to 3000 feet of the T3 study area. In addition, 3 sites important to traditional Native American values have been identified within the T3 study area: a sacred mesa, an abandoned hogan, and an abandoned camp that may have an associated grave.

VISUAL RESOURCES

The scenic quality, sensitivity, and VRM classes for T3 are summarized in Table 2-7. Map 2-3 illustrates the region of influence and visual resource ratings for landscapes encompassed by T3.

The corridor would pass within 0.5 mile of the border of CCNHP and between the main portion of the park and two of the detached units (Kin Bineola and Kin Ya'a).

ALTERNATIVE TRANSMISSION LINE T4

MINERAL RESOURCES

T4 would cross strippable coal deposits and baked shale of the Newcomb Upper Menefee and Chaco Canyon Upper Menefee areas. T4 also passes through the Grants uranium region and passes near a number of uranium prospects and underground mines.

PALEONTOLOGICAL RESOURCES

T4 crosses about 3 miles of the Fruitland Formation immediately west of the proposed plant site. Thirteen occurrences of scientifically significant fossils have been reported along the study area's southern edge here. The remainder of T4 crosses areas of low paleontological sensitivity.

SOILS

Table 2-9 summarizes those aspects of the existing soils environment that may contribute to reclamation problems for the T4 route. Soils are generally not very productive, as discussed for T1 , T2, and T3.

VEGETATION

The geographic area of influence was defined as a 200-foot-wide area along all proposed and alternative transmission line routes.

T4 and the region surrounding it differ from the other project components in that it crosses higher-elevation lands supporting Ponderosa pine, pinyon, and occasional Douglas fir and aspen. Most of these forest sites are noncommercial. Total average annual usable forage production in the region surrounding T4 is approximately 94,353 AUMs.

WILDLIFE

Elk habitat is present along T4 between MP 64 and 96. Mesa Chivato is considered permanent habitat; San Mateo and La Jara Mesa are considered crucial winter habitat. The San Mateo herd is estimated at several hundred animals, while the Mesa Chivato herd is estimated at 15 to 20 animals. Approximately 12 miles of crucial winter habitat would be traversed between MP 65 and 75, and MP 93 and 95 (Map 2-8).

Mule deer are present in areas covering approximately 75 percent of T4. The heaviest concentrations are reported along the continental divide, on Mesa Chivato, Mesa San Luis, the La Ventana area, and Mt. Taylor. The Mt. Taylor area supports approximately 500 animals; all other areas combined support 750 deer year-round and 1160 during the winter. Mule deer are generally concentrated in wooded areas, except when heavy snows occasionally force them to lower-elevation grasslands. Two areas of crucial winter habitat would be traversed by T4: MP 65 to 75, and MP 93 to 95 (Map 2-8).

THREATENED AND ENDANGERED SPECIES

Mesa Verde Cactus

Potential habitat for Mesa Verde cactus occurs in the area of influence for T4 (New Mexico Heritage Program 1982).

CULTURAL RESOURCES

A moderate portion of the T4 study area has been surveyed to identify the prehistoric and historic resources there, and the survey for sites of traditional Native American value has been relatively comprehensive. In the archaeological and historic survey localities, 156 resources have been recorded. These are primarily of Anasazi cultural affiliation, though there are also numerous Navajo and Archaic sites identified there. The T4 study area may cross up to five prehistoric Chacoan road segments, and the Kin Bineola element of Chaco Culture National Historical Park is within 2500 feet of the study corridor. In addition, inventory of the traditional religious resources has identified White Rock as site of religious significance within the T4 study area, and 2 Navajo burials may be located there.

VISUAL RESOURCES

The scenic quality, sensitivity, and VRM classes for T4 are summarized in Table 2-7. Map 2-3 illustrates the region of influence and visual resource ratings for landscapes encompassed by T4.

TRANSMISSION LINE T5

PALEONTOLOGICAL RESOURCES

T5 would cross about 3 miles of the Fruitland Formation immediately west of the proposed NMGS site. Thirteen occurrences of scientifically significant fossils have been reported along this portion of the T5 study area. The remainder of this corridor is in areas of low paleontological sensitivity.

SOILS

Table 2-9 summarizes those aspects of the existing soils environment that may contribute to reclamation problems for the T5 route.

THREATENED AND ENDANGERED SPECIES

Mesa Verde Cactus

Potential habitat for Mesa Verde cactus occurs in the area of influence for T5 (New Mexico Heritage Program 1982).

RIO PUERCO STATION

GEOLOGIC SETTING

There are active fault traces of the Rio Puerco Fault Zone in the immediate vicinity of the proposed Rio Puerco Station location.

Chapter 3

Chapter 3

ENVIRONMENTAL CONSEQUENCES

Impact assessments were conducted for all resources described in Chapter 2. Potentially significant impacts are identified based on the indicators of significance developed for each resource topic. This EIS focuses on significant impacts, which are discussed in greater detail than impacts of less significance. Other nonsignificant impacts have been identified and documented in the technical reports for each resource topic. The analytical indicators of significance of impacts are discussed in this chapter. Technical reports are available at the BLM New Mexico State Office, Albuquerque District Office, Farmington Resource Area Office, and at other locations listed in Chapter 4.

Issues and potential impacts of each environmental topic were evaluated to determine if they in turn might have an effect on other topics. For example, removal of vegetation in a pipeline ROW would affect the soils resource; an increase in recreational use of certain areas may have an effect on sensitive paleontological resources.

Discussions of impacts are presented under headings for the generating station, the water supply system, and the transmission system. In addition, separate headings are used where differences in impact are expected during the construction phase and the operation, maintenance, and abandonment phases of project implementation. Discussion of impacts is not repeated where impacts would be similar to those for project components that have already been discussed; instead, these similar impacts are summarized in the alternatives section of Chapter 1.

NEW MEXICO GENERATING STATION

Air Quality

Air quality impacts due to NMGS would be defined as significant when concentration increases added to the appropriate background levels would exceed the applicable state and national ambient air quality standards. These standards provide levels that are considered by the U.S. EPA to represent concentration levels below which human health and general welfare are not endangered. As such, they are used in this analysis as indicators of impact significance. The state and national standards are presented in Table 3-1. This table includes EPA's PSD (Prevention of Significant Deterioration) increment limits for Class I and II areas. They are presented here as a benchmark only with which to compare the concentration increases due to NMGS alone. As discussed in further detail in the Air Quality Technical Report, a PSD analysis is not conducted as part of this EIS. Such an analysis is specific to the requirements of PSD review. Under PNM's current schedule, a PSD permit application would be submitted in October 1983. However, this date may change if other components in the project schedule are altered.

Currently there are no quantitative cause-and-effect relationships between coal-fired power plant emissions and acid precipitation effects. Because theories regarding

Table 3-1. APPLICABLE NEW MEXICO AND NATIONAL AMBIENT AIR QUALITY STANDARDS AND CLASS I AND II PREVENTION OF SIGNIFICANT DETERIORATION INCREMENTS

Pollutant	Averaging Time	New Mexico Standards[a]	National Standards[b]	PSD Increments[b] Class I	PSD Increments[b] Class II
Sulfur dioxide	Annual average	0.02 ppm	80 $\mu g/m^3$	2 $\mu g/m^3$	20 $\mu g/m^3$
	24 hours	0.10 ppm	365 $\mu g/m^3$	5 $\mu g/m^3$	91 $\mu g/m^3$
	3 hours	-	1300 $\mu g/m^3$	25 $\mu g/m^3$	512 $\mu g/m^3$
Suspended particulate matter	Annual geometric mean	60 $\mu g/m^3$	75 $\mu g/m^3$	5 $\mu g/m^3$	19 $\mu g/m^3$
	24 hours	150 $\mu g/m^3$	150 $\mu g/m^3$	10 $\mu g/m^3$	37 $\mu g/m^3$
Nitrogen dioxide	Annual average	0.05 ppm	100 $\mu g/m^3$	-	-
	24 hours	0.10 ppm	-	-	-
Carbon monoxide	8 hours	8.7 ppm	10 mg/m^3	-	-
	1 hour	13.1 ppm	40 mg/m^3	-	-

[a]Except for particulate matter, the New Mexico standards are defined in units of volume (parts per million, or ppm).

[b]Federal Standards and PSD increments are defined in units of micrograms per cubic meter ($\mu g/m^3$).

the phenomena of acid precipitation and long-range transport are largely speculative, there is no indicator that can presently be used for significant effects. The discussion of acid precipitation impacts is therefore limited to potential effects, based on current research.

Visibility

In the EPA's visibility regulations (December 2, 1980), determinations of adverse impact are assessed with respect to anticipated frequency of occurrence of an "impairment" to visibility associated with a new or modified source of air pollution. Also considered in this determination are the time that such impairments are expected to occur and the intensity, duration, and extent of impairment. No further guidance is provided relating quantitative qualities to color, contrast, and visual range with adverse impact determinations.

For the NMGS analysis, the significance of visibility impacts was based on the intensity of visible plume occurrences, frequency of occurrence, and the time of such occurrences. The latter two items were assessed using the number of mornings and afternoons with projected visibility impairment within a given year. Such tabulations were broken down by season.

Intensity was assessed with respect to the plume perceptibility factor, ΔE, that is computed by the visibility model. Levels of ΔE that are greater than 4 are considered to be an indicator of significant impact. Such levels are tabulated with respect to frequency and time of occurrence. Also tabulated are ΔE levels of 5 and 10. A ΔE level of 5 represents a plume that is slightly more perceptible than one with a ΔE level of 4. A ΔE level of 10 is judged to represent a highly visible plume. The quantitative analysis of visibility related only to plume perceptibility and visibility reductions related to plumes. A quantitative analysis of visibility reduction related to regional haze was not conducted.

Visibility regulations promulgated by the EPA, and subsequent visibility models resulting from the regulations, address only plume blight impairment. Regional haze evaluation requires more sophisticated models and more information than is currently available to relate impacts to specific sources, or source categories (NCAQ 1981). The regulations currently in effect are directed at plume blight; later phases are expected to address regional haze at such time as techniques are developed by which this phenomenon can be evaluated.

Although several studies of regional haze have been, or are being, conducted, this complex problem is little understood, and no EPA-approved analytical models for regional haze currently exist (EPA 1980f). Thus, it is not possible to assess the contribution of a single source (such as NMGS) on future levels of regional haze (NCAQ 1981). (The NPS has conducted such a study, using their model, in North Dakota in Theodore Roosevelt National Park.)

Radionuclides

The increases in concentrations of the various radioactive substances that could potentially be released during combustion of coal were compared with the NMEID standards. If the concentration would be above the standard as a result of NMGS, this would be considered a significant impact.

CONSTRUCTION

No significant impacts would result from fugitive dust or gaseous pollutants resulting from construction of the NMGS (Air Quality Technical Report).

Operation, Maintenance, Abandonment

Maximum concentration increases of pollutants due to NMGS were computed to occur in the general vicinity (within 12 miles) of the project site and are shown in Table 3-2. Concentration increases due to NMGS would be below the EPA-specified levels used to determine the geographic area of influence at distances of approximately 47 miles in the southwest and westerly directions, and at distances of 30 to 38 miles in other directions. They would occur within the San Juan Air Basin. Concentration increases due to NMGS in the San Juan River valley as well as the Class I areas of Mesa Verde and San Pedro Parks would be below the EPA-specified levels. They would also be

Table 3-2. MAXIMUM COMBINED IMPACT CONCENTRATIONS AND CONCENTRATION INCREASES DUE TO NMGS ALONE PROJECTED FOR PROJECT VICINITY AND COMPARISON WITH NEW MEXICO AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	New Mexico Standards	Combined Maximum Concentration[a]	Maximum Concentration Increase due to NMGS Alone
SO_2	24-hour	0.10 ppm	0.060-0.065 ppm[b]	0.029 ppm[c]
	Annual	0.02 ppm	0.007 ppm[d]	0.002 ppm[e]
NO_2	24-hour	0.10 ppm	0.060-0.071 ppm[c]	0.054 ppm[c]
	Annual	0.05 ppm	0.009 ppm[d]	0.003 ppm[e]
TSP	24-hour	150 $\mu g/m^3$	115-130 $\mu g/m^3$ [f]	13-27 $\mu g/m^3$ [g]
	Annual	60 $\mu g/m^3$	48-57 $\mu g/m^3$ [f]	3-5 $\mu g/m^3$ [g]

[a]Represents the modeled emissions of San Juan and Four Corners power plants, with NMGS, added to a range of "non-power plant" baseline concentrations. This is explained in further detail in the Air Quality Technical Report.

[b]Located approximately 10 miles north of NMGS.

[c]Located approximately 8 miles southeast of NMGS.

[d]Located approximately 25 miles north of NMGS.

[e]Located approximately 12 miles north-northeast of the plant site.

[f]These values represent the fugitive dust emissions resulting from the coal- and ash-handling facility combined with the hypothetical mine and added to the baseline concentration. They are predicted to occur within 3 miles of NMGS. These values were predicted to be greater than TSP due to stack emissions.

[g]Same as footnote f above, except the hypothetical mine is not included.

below the Class I increment limits contained in EPA's PSD regulations.

The maximum concentration increases, when combined with Baseline 1 and Baseline 2 levels, result in total predicted concentrations that are less than the applicable New Mexico and federal ambient air quality standards. The combined concentrations as well as the concentration increases from NMGS alone are presented in Tables 3-2 and 3-3, which present comparisons with the New Mexico and federal ambient air quality standards, respectively.

Maximum combined concentrations would occur at locations to the north of the project site. Maximum concentration site. Maximum concentration site. Maximum concentration increases due to NMGS alone are expected to occur generally in the southeast direction from the project site.

Stagnation Episodes

Stagnation episodes are defined as the persistence of low wind speed conditions for extended periods of time. The project region does not usually experience stagnation episodes of long duration, as evidenced by the three-year meteorological data base collected by PNM at the project monitor site.

The effect of air pollutant emissions from NMGS during stagnation episodes was simulated using dispersion modeling. Because these episodes would not be expected to persist for periods of longer than a few hours, compliance with the 3-hour SO_2 federal ambient air quality standard was assessed.

The model predicted a short-term concentration increase of less than 0.046 parts per million (ppm) from NMGS alone, under stable conditions and a low (2.0 meters per second) wind speed. This value is 65 percent lower than the maximum predicted from modeling using actual meteorological data for NMGS alone.

The lower concentration increase value mentioned above is attributed to the fact that under low wind speed and stable conditions, the power plant plume would rise to great heights, thus reducing ground-level concentrations. Higher wind speeds reduce plume rise and thus increase ground-level concentrations.

Acid Precipitation

No quantitative techniques are currently available with which to project acid precipitation formation and effects due to a particular source. However, if increases in acid precipitation as the result of NMGS do occur, the alkaline nature of soil in the San Juan Basin and the presence of soil in local waterways should serve as a buffer and minimize any impacts to wildlife, vegetation, or aquatic resources in the San Juan Basin. Based on the available literature, the potential for an impact associated with acid precipitation exists for high mountain lakes in northern New Mexico and in Colorado (Air Quality Technical Report). Impacts may result in these lakes because they are poorly buffered, making them susceptible to reductions in pH caused by acid precipitation that could affect sensitive biota. Assuming that there is potential for acid precipitation effects in these high mountain lakes and that it is related to SO_2 and NO_x levels, then NMGS could potentially have an impact by contributing along with the cumulative emissions from other sources in the region, plus other sources as far away as the West Coast. Based on the total emissions projected for a three-state area (New Mexico, Utah, and Colorado), NMGS would contribute approximately 3 percent of this total.

Under NEPA requirements, in cases where scientific evidence is lacking or is subject to widespread scientific debate, an impact assessment must be based on worst-case assumptions. Thus, under worst-case assumptions, there would be a potential for NMGS to contribute to an adverse impact in high mountain lakes.

Visibility

NMGS would contribute to the regional haze now visible from Chaco Culture National Historical Park. The results of visibility analyses indicate that the plume from NMGS could be slightly visible from the San Pedro Parks Wilderness Area and Mesa Verde National Park. Because of the distance of these sites from NMGS (75 miles), neither plume perceptibility nor visibility impairment as a result of plumes would be

Table 3-3. MAXIMUM COMBINED IMPACT CONCENTRATIONS AND CONCENTRATION INCREASES DUE TO NMGS ALONE PROJECTED FOR PROJECT VICINITY AND COMPARISON WITH FEDERAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	Federal Standards ($\mu g/m^3$)	Combined Maximum Concentration[a] ($\mu g/m^3$)	Maximum Concentration Increase due to NMGS Alone ($\mu g/m^3$)
SO_2	3-hour	1300	617-659[b]	290[c]
	24-hour	365	134-147[d]	64[c]
	Annual	80	16[e]	4[f]
NO_2	Annual	100	14[e]	10[f]
TSP	24-hour	150	115-130[g]	13-27[h]
	Annual	75	48-57[g]	3-5[h]

[a]Represents the modeled emissions of San Juan and Four Corners power plants, with NMGS, added to a range of "nonpower plant" baseline concentrations. This is explained in further detail in the Air Quality Technical Report.

[b]Located approximately 9 miles east-northeast of NMGS.

[c]Located approximately 8 miles southeast of NMGS.

[d]Located approximately 10 miles north of NMGS.

[e]Located approximately 25 miles north of NMGS.

[f]Located approximately 12 miles north-northeast of the plant site.

[g]These values represent the fugitive dust emissions resulting from the coal- and ash-handling facility combined with the hypothetical mine and added to the baseline concentration. They are predicted to occur within 3 miles of NMGS. These values were predicted to be greater than TSP due to stack emissions.

[h]Same as footnote g above, except the hypothetical mine is not included.

frequent or significant. From Chaco Culture National Historical Park, the maximum occurrence of perceptible plume discoloration (ΔE 4 level) is likely to be during the winter. Such discoloration is predicted to occur about 36-37 mornings and 5-6 afternoons per year. Highly perceptible plume discoloration (the indicator ΔE 10 level, as discussed above) is predicted to occur about 1-2 mornings per year, the maximum occurrence again indicated in the winter.

Radionuclides

Modeling of radionuclide emissions was based on the content of radioactive substances in the coal and assumed that 100 percent of these substances would be emitted upon combustion of the coal. The concentration increase of all radionuclides was predicted to be 0.0049 percent of the New Mexico Environmental Improvement Division (NMEID) standards for protection against radiation for unrestricted areas. This impact would be insignificant, based on the previously defined indicators of significance.

NOISE

Noise impacts were evaluated with respect to health impacts, activity interference, and perceptivity impacts. Health impacts are assessed with regard to the effect of noise upon human hearing. Activity interference is assessed with respect to impairment of conversation. The EPA recommends an outdoor noise level of 55 decibels as requisite to protect human hearing and prevent activity interference. This level was used as a guideline with which to compare total noise levels resulting from operation of NMGS.

Perceptivity impacts are related to how noise levels are likely to be judged (loud, soft, no difference) by the listener. Observations that have been made reveal that a change in noise level (i.e., an increase) of about 9 dB(A) represent a doubling of perceived loudness of the "noisiness" of a sound (Stevens 1972). Because of the isolated nature of the nearby Bisti and De-na-zin WSAs and the low baseline noise levels there, it was assumed that a noise increase of 9 dB(A) should be considered significant in such areas. These assumptions were based on consultation with recreation and wilderness values specialists.

CONSTRUCTION/OPERATION, MAINTENANCE, AND ABANDONMENT

Probable impacts from construction and operation of NMGS have been assessed by using data obtained in the area of the operating Four Corners and San Juan power plants. These plants are considered representative of conditions during operation of NMGS. Significant impact of plant noise was not observed beyond 0.5 mile from the plant boundaries. Monitoring at San Juan Generating Station indicated no detectable impact at distances beyond 2 miles from the plant boundary.

The Bisti and De-na-zin WSAs are located approximately 2 and 3.5 miles from the proposed NMGS plant facilities, respectively. Based on the above, power plant noise has been found to decrease to existing levels at distances of approximately 2 miles. It is concluded that noise due to operation of the NMGS should be barely discernible at the WSAs. Thus, no significant impact is expected at these or locations farther than 2 miles (including Chaco Culture National Historical Park).

Noise impacts due to increased employee automobile traffic associated with NMGS were also calculated and compared with the baseline noise levels. Such noise levels are inclusive of automobile and haul truck traffic associated with the "hypothetical mine," as well as blast noise from this mine. Details of the calculations are presented in the Air Quality Technical Report.

At the Bisti WSA, noise levels are projected to increase slightly (approximately 1 dB[A]) above baseline levels there. At the De-na-zin WSA, it is not known to what degree traffic associated with the hypothetical mine would use the road adjacent to this area (Road C-15). Assuming that the baseline results in negligible traffic use of this road, a moderate increase in the amount of traffic on C-15 (i.e., 20 to 30 vehicles per hour) would be likely to result in a 9 dB(A) increase above baseline noise levels at the boundary of the WSA. In the situation in which C-15 would experience maximum use

by employees associated with the hypothetical mine, approximately 700 vehicles per hour would be necessary to cause such an increase above baseline levels at the boundary. Within the WSA itself (1/4 mile from Road C-15), approximately 2000 vehicles per hour would be necessary to cause the 9 dB(A) increase above baseline noise levels.

It is not likely that such large traffic volumes would occur on C-15 as a result of NMGS. However, the former situation, which assumes a low level of traffic on C-15 in the baseline, presents a potential for significant impact at this WSA (see Wilderness section).

GEOLOGIC SETTING

Indicators of significance were identified as follows:

- Disturbance to or destruction of a geologic feature not found elsewhere in the San Juan Basin or a geologic feature of unusual scientific value for study and interpretation
- Geologic conditions potentially damaging to project components

CONSTRUCTION/OPERATION, MAINTENANCE, AND ABANDONMENT

No impacts to unique geologic features or locations of unusual scientific value were identified. The potential for geologic hazards to project components that should be considered in the foundation or structural design and construction of components is detailed in Table 3-4. Where high potential for geologic hazards exists, structural failure of project components could result in significant impacts to health and safety.

MINERAL RESOURCES

Indicators of significance were identified as follows:

- Preemption of extraction of mineral resources underlying project features and either exceeding value of project feature or not readily available elsewhere
- Consumptive use of 1 percent or more of the available mineral resources in the geographic area of influence

CONSTRUCTION

Construction of NMGS would result in the consumptive use of 225,000 cubic yards of sand and gravel. No significant impacts would result.

OPERATION, MAINTENANCE, AND ABANDONMENT

Operation of NMGS would result in consumptive use of 300 million tons of coal and 4 million tons of limestone over the 40-year life of the project. Use of this amount of limestone would not constitute a significant impact. Consumption of 300 million tons of coal would be considered a significant impact on a local and regional level. More than 1 percent of the estimated strippable coal reserves in the Bisti area (local) and within a 30-mile radius of the NMGS plant site (regional) would be consumed. From a national perspective, this coal consumption would not constitute a significant impact.

Coal for NMGS would be acquired through negotiated purchase contracts based on the available coal supply in the region (an estimated 4 billion tons of strippable subbituminous coal reserves within 30 miles of NMGS site).

The proposed coal supply for the operation of NMGS is a joint venture of Sun Belt Mining Company and Arch Minerals. Sun Belt Mining has approximately 120 million tons under existing lease, while Arch Minerals has pending PRLAs for approximately 400 million tons. Impacts from coal mining of these existing leases and pending PRLAs have been addressed in the Star Lake-Bisti Regional Coal SLBRC EIS and the SJRRCL EIS. Additional environmental analysis will be conducted by the Office of Surface Mining (OSM) before actual mining operations begin.

Through letters of interest, PNM has also identified other potential coal suppliers. For

Table 3-4. PROJECT COMPONENTS EXPOSED TO POTENTIAL GEOLOGIC HAZARDS

Potential Hazard	Project Component											
	NMGS	P1[a]	P2[a]	P3[a]	R1	R2	T1	T2	T3	T4	T5	Rio Puerco Substation
Landslides				High			High			High		
Spontaneous combustion	Low	Low	Low	Low			Low	Low	Low	High	Low	
Soluble soils	Low				Low	Low						
Expansive soils	High				Low	Low						Low
Collapsing soils	Low				Low	Low						
Accelerated erosion	Low	Low	Low	High								
Piping	Low				Low	Low				Low		
Mine subsidence										Low		
Seismic shaking	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	High
Seismically induced ground failure		Low	Low	Low						Low		
Surface fault rupture							Low	Low	Low	Low		Low

Note: "Low" indicates some potential may exist; "high" indicates that a relatively high potential appears to exist.

[a]Including intake pumping plant and booster pumping stations.

example, among these potential coal suppliers are:

Utah International (750 million tons-existing mine)

Consolidated Coal (500 million tons-existing mine)

Chaco Coal (347 million tons-existing lease)

Santa Fe Coal (130 million tons-existing lease)

All of these mines are included in Baseline 1 and their environmental impacts are part of the existing environment. Each of these mines has had or will have full analysis of the environmental impacts of mining.

Based on the above coal supplies, there is sufficient coal in existing mines and/or under existing leases to fuel all four units for the life of the plant (40 years per unit). PNM is required to obtain an economical coal source; therefore the exact coal supply cannot be determined until the time of contract negotiations.

Impacts of coal handling and processing from delivery point at the NMGS to proposed disposal areas are addressed in detail (FEIS Chapter 1, Project Description TR). The following is a summary of general impacts of coal mining. See the SLBRC and SJRRCL EISs for more specific discussion of coal mining impacts.

At maximum electric generation, approximately 900 million tons of coal would be used annually for NMGS. Based on a coal seam thickness of 15 feet, this would result in approximately 122 acre-feet per year of water for haul-road dust suppression. Labor productivity in coal mining is commonly expressed in tons of coal produced per hour of labor utilized in production. Based on the assumption of a variety of variables, the labor required in the direct and indirect production of coal to supply NMGS would be about 500 workers annually. Coal mining would also result in disturbance to such resources as archaeology and paleontology and in the loss of vegetation and wildlife habitat until reclamation was successful (see SLBRC and SJRRCL EISs for specifics). Additional impacts would occur from hauling the coal from the mine to the power plant. Depending on the distance involved, this could either be by rail, truck, or conveyor belt.

PALEONTOLOGICAL RESOURCES

In this study, a fossil was considered significant if it fulfilled any of the following criteria:

- It provides important information on the evolutionary trends in organisms, relating living inhabitants of the earth to extinct organisms or clarifying relationships among extinct organisms.
- It provides important information regarding development of biological communities, or interaction between botanical and zoological biotas.
- It demonstrates unusual or spectacular circumstances in the history of life.
- It is in short supply and in danger of being depleted or destroyed by the elements, vandalism, or commercial exploitation, and is not found in other geographic locations.

A fossil was not considered significant if:

- It's a species that occurs in large numbers throughout a large geographic area.
- It does not provide additional scientific data not found in other specimens of the same species.
- It does not fulfill any of the significance requirements listed above.

In order to determine the magnitude of anticipated impacts to significant fossils, the study area was classified into zones reflecting the relative sensitivities of paleontological resources to disturbance by the proposed development. It is important to note that this classification takes into account the

specific type of development proposed for each part of the study area and not merely the abundance and significance of fossils in a given geographic area.

The vast majority of fossils would be located in bedrock; so an area that contains rich and important paleontological resources is given a relatively low sensitivity classification if the specific type of development proposed for that area entails little or no appreciable disturbance of bedrock.

The classification consists of three zones or categories of sensitivity: high, moderate, and low.

- High Sensitivity: Regions where abundant significant fossil assemblages or individual fossils have been recovered; where high potential exists for natural erosion to expose more significant material; or where the proposed development is likely to cause direct disturbance to material exposed at the surface or interfere with the future recovery of potentially significant fossils.

- Moderate Sensitivity: Regions where significant fossils are known to occur in low abundance; where a realistic probability exists for natural erosion to expose more significant material but in low abundance; or where development is likely to result in limited direct disturbances to material exposed at the surface or interfere with future recovery of significant fossils.

- Low Sensitivity: Regions where no fossils or only insignificant fossils are known to occur, where there does not appear to be a realistic probability that natural erosion will expose new material, or where the scheduled development will result in no appreciable disturbance to bedrock.

CONSTRUCTION/OPERATION, MAINTENANCE, AND ABANDONMENT

Areas of significant paleontological resources could be adversely affected by the construction and operation of the proposed project, either directly by the destruction, damage, or alteration of bedrock formations or indirectly by the increased recreational fossil collecting or commercial collection of materials. The proposed plant facility is in an area of high paleontological sensitivity (Map 3-1).

SOILS, PRIME AND UNIQUE FARMLAND

SOILS

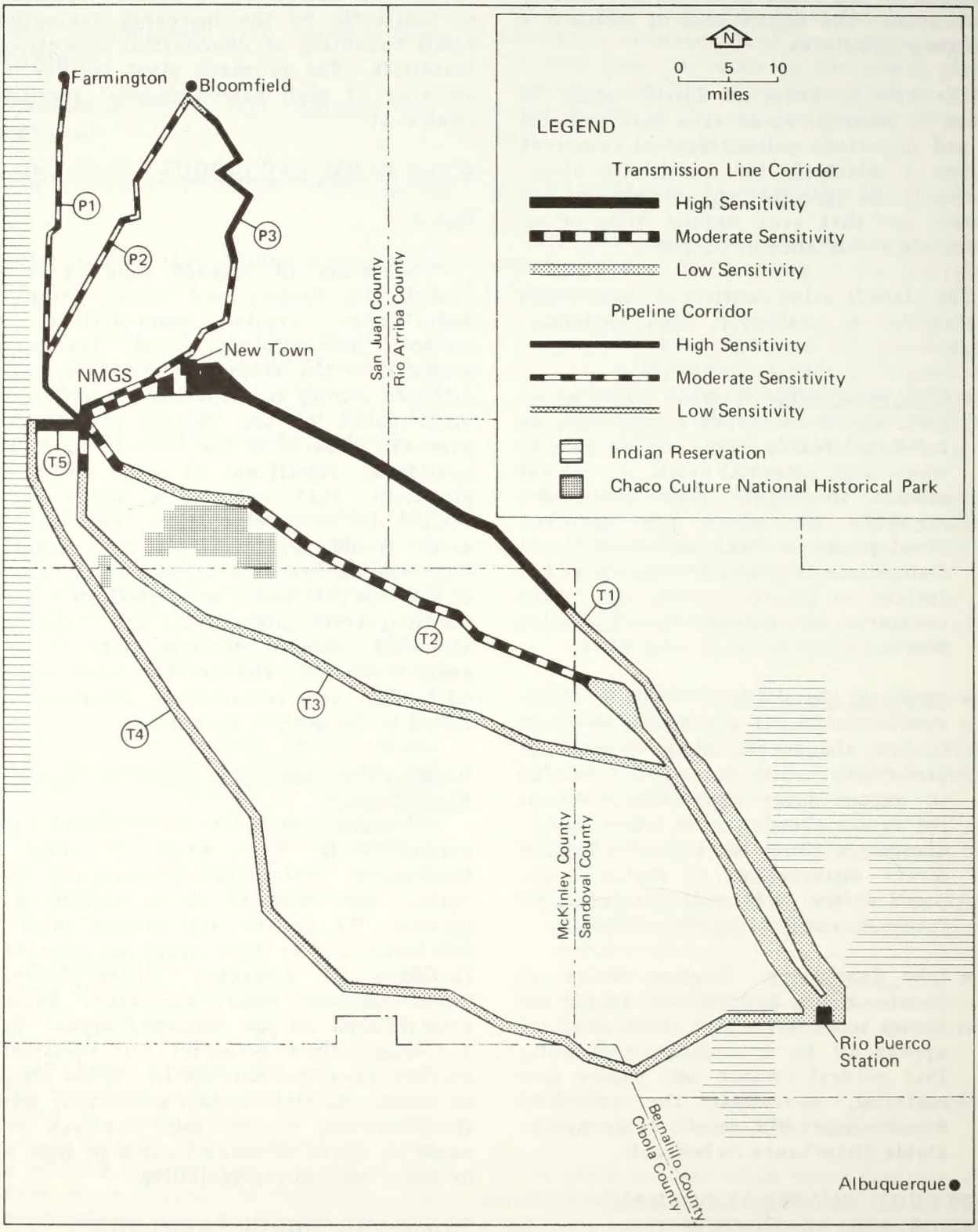
Indicators of impact significance included the degree and areal extent of disturbances, erosion susceptibility, and erosion susceptibility, and reclamation potential of the areas that would be directly affected during construction, operation, and maintenance of the various project components. Impacts to the soils resource were considered significant if there is a high probability that soil erosion would not be limited to acceptable levels and disturbed areas would not be able to revegetate. ("Acceptable level" is defined as the amount of soil loss that would not significantly affect the long-term productivity and stability of disturbed areas.) Findings were based on analysis of soils and terrain traversed, and mitigation and reclamation measures contained in the project description.

Construction/Operation, Maintenance, and Abandonment

Construction of the NMGS would disturb approximately 2400 acres of soils and topography. Soil surface disturbance, excavation, and removal of vegetation would increase the present soil erosion rates and soil instability in those areas not covered by facilities or surfaced. These increases would continue until vegetation becomes reestablished on the disturbed areas. Table 2-5 summarizes potential soil reclamation problem areas for the NMGS. In the absence of successful reclamation, potentially significant impacts to the soils resource would occur in areas of steep terrain or high wind or water erosion susceptibility.

PRIME AND UNIQUE FARMLAND

Impacts were considered significant if any prime or unique farmlands were to be taken out of production by surface facilities



Source: BLM 1982.

Map 3-1. RELATIVE PALEONTOLOGICAL SENSITIVITIES WITHIN THE STUDY AREA

associated with the Proposed Action or alternatives.

Construction/Operation, Maintenance, and Abandonment

Since the surface facilities associated with the Proposed Action and alternatives would not be located on prime or unique farmlands, no impacts to them would result from project implementation.

HYDROLOGY

The principal hydrologic issues that have been addressed in this impact assessment are those likely to be affected by the proposed NMGS. These issues were selected during the scoping process on the basis of: (1) the description of the Proposed Action and alternatives, and (2) generalized knowledge of hydrologic conditions in the potentially affected geographic region. From initial analysis of the project description and hydrologic conditions, it became apparent that some aspects of the hydrologic environment would be more likely than others to be affected by the proposed NMGS, or that some could be affected much more seriously than others. On this basis, subsequent collection and analysis of data focused on issues that would be most relevant to the assessment of potential hydrologic impacts related to NMGS and to other actions proposed to occur contemporaneously and in the same approximate geographic region.

The principal hydrologic issues that have been addressed are:

1. Impact of proposed NMGS water uses on other surface-water users. This issue includes: (a) the availability of water from Navajo Reservoir and the Upper Colorado River Basin for uses in New Mexico, (b) provisions of interstate compacts and to proposed surface-water uses, (c) effects of diversion of water from the San Juan River on downstream users, (d) discussion of the San Juan River stream-system adjudication suit and other conflicts or controversies that may affect water rights proposed for project uses, and (e) effects of well-field pumping on streamflow or springflow.

2. Impact of proposed NMGS water uses on other ground-water users. This issue includes (a) the effects of pumping the wellfield that would tap the Westwater Canyon Member aquifer on other wells within the study area, and (b) effects of other project components on ground-water users.

3. Flooding potential. Comparison of 100- year floodplain with locations of project facilities. For "critical actions" associated with the proposed NMGS, the 500-year floodplain is used for comparison. This issue also includes an evaluation of an increase in flooding potential as a result of a project facility.

4. Subsidence potential. Evaluation of potential for land subsidence due to withdrawal of ground water from the wellfield.

5. Changes in runoff conditions. This issue includes (a) effects on peak discharge, (b) effects of impoundments or diversions associated with the proposed NMGS, and (c) effects on recharge to alluvial aquifers.

Certain threshold values were selected during the scoping process (Hydrology Technical Report) for use as indicators for assessing the significance of impacts on the hydrologic systems as a result of NMGS. One or more indicators were established to correspond to each of the principal hydrologic issues discussed above. In general, environmental impacts would be considered significant if the predicted effect exceeds the value of the indicator(s) for that particular hydrologic issue.

The indicators of significance are as follows:

1. Impact on surface-water users. (a) Indicator: project causes a predictable decrease in water available to existing users. Various statistical low-flow measures (e.g., 10-year, 15-day streamflow) or historic drought periods are adopted as standards of reference by which to judge the impacts on existing surface-water

users. Rules for water allocation in the event of shortages, which are specified in interstate compacts and in federal and state regulations, are complied within the evaluation of these impacts. (Impacts on in-stream users, such as habitat for aquatic life, are addressed in the Technical Report on Wildlife and Aquatic Biology.) (b) Indicator: project causes the average daily flow of any perennial stream or spring to decrease by more than 15 percent.

2. Impact on ground-water users. Indicator: the water supply system causes the potentiometric surface in any aquifer to decline by more than 25 feet.

3. Impact due to flooding potential. (a) Indicator: project facilities that are located within a 100-year floodplain. The 500-year floodplain is used for comparison for "critical actions" associated with NMGS. (b) Indicator: flood elevations are increased by more than 1 foot.

4. Impact due to subsidence potential. Indicator: ground-water withdrawal for the project that causes a potential for land subsidence of greater than 1 foot.

5. Impact due to changes in runoff conditions. (a) Indicator: project causes an increase of more than 15 percent in the peak runoff in an ephemeral stream from a precipitation event with a 10-year recurrence interval. (b) Indicator: project causes the recharge to alluvial aquifers to decline by more than 15 percent, due to impoundment of ephemeral streamflow.

OPERATION, MAINTENANCE, AND ABANDONMENT

Changes in runoff conditions in De-na-zin Wash due to the water storage reservoir, storm water retention ponds, and an increase in impervious area resulting from the plant facilities would be relatively minor because of the relatively small tributary contribution of the drainage area in the vicinity of the NMGS site compared with the 184-square-mile drainage area of De-na-zin Wash upstream of the plant site.

WATER QUALITY

Based on the project description and information about the generic effects of different project components, potential effects were identified. The magnitude of these potential effects was then compared with indicators of significance.

A water quality impact was judged to be significant when the standards or criteria that have been designated to protect beneficial uses of the water body in question were predicted to be exceeded. Specific standards include the surface- and ground-water quality standards of the New Mexico Water Quality Commission. Specific water quality criteria include those listed in EPA's "Blue" book (NAS 1973) and "Red" book (EPA 1976), and the recently promulgated water quality criteria for toxic pollutants.

CONSTRUCTION

Because of planned erosion control measures, detailed in Chapter 1, and the already very high suspended solids levels, increases in suspended solids levels in De-na-zin Wash and its tributaries would be negligible. Spills of construction-related liquids (such as fuels, solvents, and oils) would degrade soils in the immediate vicinity of the spill. The previously discussed erosion control measures would limit the movement of contaminated soil particles to De-na-zin Wash and its tributaries.

OPERATION, MAINTENANCE, AND ABANDONMENT

The proposed water and wastewater management system is not expected to discharge any liquids into area streams under normal operating conditions. Available information indicates that similar designs have resulted in successful zero-discharge systems. However, discharges of coal-pile runoff under high rainfall conditions (the

coal-pile runoff pond would be designed to contain runoff from the 10-year, 24-hour storm) and of wastewater from the plant under upset or off-design conditions could potentially occur. The relatively dry climate and the relative success of present design concepts indicate that few discharges would occur. Discharges from the coal pile (storing low-sulfur coal) would probably be similar in quality to that found in De-na-zin Wash and would probably occur in conjunction with high flows in De-na-zin Wash. These high flows would tend to dilute the concentrations of any constituents that were higher in coal-pile runoff than in De-na-zin Wash runoff. Discharges of plant wastewater during upset or off-design conditions would flow downstream in De-na-zin Wash. The downstream distance the discharge would travel would depend upon the volumetric rate and duration of the discharge. Short-duration, small-volume discharges would probably infiltrate into the alluvium along the De-na-zin Wash. Longer-duration, larger-volume discharges would travel farther downstream.

While some loss from evaporation would be expected, the ultimate fate of most of the water would be the alluvial water-bearing zones in the downstream channels. Because of the conceptual nature of the present plans for the water and wastewater management system and the unplanned nature of the discharge, the specific quality characteristics of potential discharges cannot presently be predicted. It is likely, though, that the TDS content of such unplanned discharges would be higher than that found in some alluvial wells downstream of the plant.

If the liners beneath the storm runoff and evaporation ponds work as planned, loss of liquids from the ponds would be small. Monitoring systems would be designed to detect such losses and, if necessary, to signal the need for remedial actions or operational changes. Off-site leachate migration away from the solid waste disposal sites would not be expected because the limited precipitation and high evaporation rates severely limit the amount of water that could enter the disposal site. For similar reasons, water movement into the disposal site from adjacent formations is expected to be negligible.

VEGETATION

Riparian vegetation and other types that comprise less than 1 percent of the region of comparison (a 10-mile radius around the plant site or a 20-mile-wide strip centered on ROWs) were defined as locally rare or unique vegetation types. If anticipated project impacts removed or altered 1 percent or more of a unique or rare type in the region of comparison around a proposed or alternate project component, the first indicator of significance was met. If the impact was considered adverse and long term (at least 3 years, or three growing seasons), then the impact was defined as significant. For more common vegetation types, impacts were assessed case by case, considering the particular types, their abundance, and their role in the region.

CONSTRUCTION/OPERATION, MAINTENANCE, AND ABANDONMENT

Removal of the majority of vegetation on the proposed plant site is identified as a large-magnitude impact but not a significant impact. The impact is not considered significant because of the abundance of similar vegetation types (shrubland/grassland) in the region of comparison. Approximately 155 AUMs per year would not be available for forage production and livestock grazing over the 40-year life of the project. This is not considered significant because of the abundance of similar or better quality range in the region of comparison.

WILDLIFE

Impacts to crucial wildlife habitat were analyzed for several important categories of wildlife: (1) recreationally or commercially important species (generally game species), (2) species characterized by uncertain or declining population status, (3) rare species, and (4) those species expected to be sensitive to project activities and which, as a result, may not be capable of sustaining current populations. Crucial habitat is defined as those areas important for the maintenance and perpetuation of wildlife populations. Generally these areas are characterized by population concentrations during critical

periods (e.g., winter range, breeding grounds, or brooding grounds). Within these periods, populations are very susceptible to human disturbance and effects on individuals may result in the loss of several generations of progeny. Species not included in categories designated as "important" include species such as songbirds, small mammals, and insects. These species are not generally considered recreationally or commercially important and generally are capable of rapid recovery and repopulation of disturbed areas due to large population sizes, rapid turnover rates, and mobility.

In order to evaluate the significance of impacts to crucial areas due to habitat removal (residual impacts such as loss of carrying capacity) two indicators were considered:

1. Each crucial wildlife area identified through data compilation and personal communication with persons knowledgeable about the areas was analyzed to determine the relative extent of habitat disturbance that would be expected to result from the Proposed Action or alternatives. If less than 1 percent of the total available crucial habitat within the geographic area of influence is expected to be disturbed by the project activities, then the significance of that impact was considered to be low. If it was determined that more than 1 percent of the total would be disturbed (see indicator 2), then analysis was conducted in further depth to identify possible significant impacts.

2. This indicator would be applied if a finding of significance was made from indicator 1 (greater than 1 percent disturbance). If the amount of disturbance was found to be greater than 1 percent, further analysis determined whether the nature of disturbance would create beneficial or adverse impacts, as well as short-term or long-term impacts, to the wildlife resources. For purposes of this determination, the following definitions were employed:

   - Short-term: The impact is expected to persist less than 5 years.

   - Long-term: The impact is expected to persist more than 5 years.

CONSTRUCTION/OPERATION, MAINTENANCE, AND ABANDONMENT

Approximately 2400 acres of nongame wildlife habitat and habitat supportive of small numbers of quail and dove would be removed at the proposed NMGS site. No significant impacts were identified as the result of this habitat removal.

Greater hunting and fishing pressure would occur as the result of increased populations associated with the construction and operation of NMGS. Based on the state of New Mexico population projections (Recreation Technical Report), estimates of increased fishing pressure indicate that an average of 15,500 additional fish would be harvested per year through the year 2000; projections for increased hunting pressure indicate that an average of 45 additional mule deer would be harvested per year through the year 2000. (This represents an approximate 2 percent increase in harvest over baseline conditions.) It is not possible to predict the area in which increased hunting and fishing would occur because desirable hunting and fishing areas are found throughout the geographic region. However, it is likely that areas that have historically supported the most hunting and fishing pressure would sustain the largest increases in harvest. Increased stocking programs in quality fishing areas (e.g., San Juan River) may be necessary to meet projected increases in recreational use.

Human-related disturbances in the geographic area of influence would result in increased intentional and unintentional harassment of wildlife. Impacts would result from such activities as off-road vehicle activity, target shooting, camping, poaching, and general increases in human presence. Although impacts cannot be quantified, they would include increased road kills, displacement of animals to other habitats, and occasional interference with reproductive success.

No raptor nesting sites would be removed by project construction activities, and the percentage loss of hunting territories would be small compared with habitat that would be left undisturbed. Construction of project components during periods of raptor nesting and rearing of young would result in various human-related disturbances to nesting raptors that are located in the area of geographic influence. The potential for such impacts as abandonment of nesting sites or abandonment of young in the nest would depend on specific nest locations relative to construction activities, but could constitute significant impacts.

No significant impacts to special status species (New Mexico or Colorado state-protected or species of concern to the BLM) were identified. Aquatic habitat in high mountain lakes and streams of New Mexico and Colorado, which may be subject to potential acid precipitation, supports an important coldwater fishery and other aquatic species. Game fish and other aquatic species expected to occur in these areas are described in various references, including Koster (1957).

THREATENED AND ENDANGERED SPECIES

Determination of impacts to threatened or endangered species was based on an assessment of project components that could potentially affect proposed listed species. Findings of "may affect" were made if a species or potential habitat has been reported in the geographic area of influence (3.75 square miles at the plant site) and if there is potential for direct or indirect impacts to individuals, populations, or critical habitat. A finding of "no effect" was made if the species or potential habitat has not been reported in the geographic area of influence or there is little potential for direct or indirect impacts.

CONSTRUCTION

No threatened or endangered species would be affected because the species of concern do not occur in areas that would be disturbed by construction activities.

OPERATION, MAINTENANCE, AND ABANDONMENT

The only impacts identified to threatened or endangered species that could result from operation and maintenance of the proposed NMGS are impacts associated with the potential for acid precipitation under worst-case analysis. The general potential for these impacts is discussed in the Air Quality section. Additional analysis and the consequences of acid precipitation are discussed for each species in the Threatened and Endangered Species Technical Report. With the exception of the greenback cutthroat trout, no impacts resulting from acid precipitation were identified for any threatened or endangered wildlife or aquatic species. A summary of the findings from the Threatened and Endangered Species Technical Report is presented below.

The headwater streams in high mountain areas of southern Colorado that support the greenback cutthroat trout may be susceptible to increases in acidity from potential acid precipitation. These streams lack the buffering capacity of lower-elevation streams because they usually lie in unreactive sandstone or granitic bedrock which are incapable of neutralizing the acidity of precipitation and have little buffering capacity. In addition, greater rates of precipitation that occur at higher elevations would result in relatively high rates of total acid deposition compared with lower elevations. If these high mountain, headwater streams receive acid precipitation and the waters become acidic, the greenback cutthroat trout may be affected. Acidic water has the potential to cause sublethal effects, such as inhibition of larval development, or to cause direct mortality. The probability of occurrence of these impacts and the potential magnitude of such impacts cannot be quantified.

With the exception of the Mancos milkvetch, no impacts resulting from acid precipitation were identified for any plant species. Two factors limit the potential for impacts to the species: (1) Each of the plant species assessed occurs at relatively low elevations (5000-8000 feet) where mean

annual rainfall and frequency of precipitation are low; as a result, exposure to acid precipitation, either directly (on leaf and stem tissue) or indirectly (via the root system), would also be infrequent. (2) All of the plants considered in the assessment, except for Mancos milkvetch, are reported from soils that are slightly basic and well buffered, and therefore capable of neutralizing atmospheric acidity carried down by precipitation. Several of the species assessed are generally associated with saline and calcareous Mancos Shale. (Refer to the Threatened and Endangered Species Technical Report for a species-specific discussion of the buffering capability and sensitivity of soils to acid precipitation.)

Mancos milkvetch occurs on noncalcareous sands that may not provide substantial buffering capacity. Since there is no clear evidence that potential acid precipitation would be neutralized by soil carbonates, a determination of "may affect" is identified in the Threatened and Endangered Species Technical Report.

CULTURAL RESOURCES

An overview of the cultural resources of the proposed project area has been completed, addressing prehistoric and historic archeological sites, historic properties, and sites of significance to traditional Native American religious values and practices (Cultural Resources Technical Report). In addition, an inventory of identified cultural resources within the study area, including the plant site and 2-mile-wide study areas centered on the proposed water supply and transmission system components, has been compiled and evaluated. This inventory of previously identified cultural resource sites was used for an evaluation of anticipated impacts and also provided a basis for judging the likelihood of the presence of other presently unidentified sites in the proposed project area and their sensitivity to impacts.

The indicators of significance used in the analysis of cultural resources have been adapted from federal regulations (36 CFR 60.6) that set forth minimal criteria for determining whether or not a cultural resource is "significant"--that is, is important enough to merit management consideration by projects that affect it. These criteria include:

- Sites associated with significant historic events
- Sites associated with significant historic people
- Sites that embody distinctive architectural or artistic features
- Sites that "have yielded, or may be likely to yield, information important in prehistory or history"

Most of the prehistoric and historic resources that might be affected by the proposed NMGS development are already determined to be eligible for, or are potentially eligible for, the National Register of Historic Places because of their likelihood of yielding important scientific information. However, within the body of sites that meet this minimal criterion, there is a wide range of the kinds and type of such information held in those sites and of the importance of those included data.

CONSTRUCTION/OPERATION, MAINTENANCE AND ABANDONMENT

The proposed construction and operation activities would directly alter, damage, or destroy an unknown number of presently unidentified subsurface sites, as well as the 40 presently identified archaeological and historic sites or sites of importance to traditional Native American values. Alteration, damage, or destruction of some of these resources could result in:

- Loss of scientific and cultural information and artifacts
- Loss of the physical expression of the resource, and visual/auditory impairment of the associated traditional cultural experiences or culture-historical values

In addition to direct impacts, significant indirect adverse impacts could occur as a result of the construction and maintenance of the proposed project. These indirect effects include:

- Increased exposure of archaeological sites (as from construction and maintenance activities, or increase in recreational use of off-road vehicles in the basin), resulting from loss of vegetation cover and increased erosion

- Increased uncontrolled collection of the archaeological resources and Native American materials (e.g., American materials (e.g., shrine offerings) by hobbyists, as recreational activity

- Increased commercial looting of archaeological resources

- Decreased opportunities to maintain a traditional Native American lifestyle and values, which require the maintenance of sacred sites

VISUAL RESOURCES

Visual resources are the physical characteristics of a landscape that determine its scenic quality and relevant value to the viewing public. These characteristics are described according to the line, form, color, and texture of the natural features in the environment (landform, vegetation, water, and soils) that make up a specific landscape. Since scenic quality is a measure of human sensory experience, the visual resources most important to this assessment are those within the "seen area" of both existing and potential areas accessible to people (roadways, rivers, trails, recreation sites, and human developments). The focus of attention is on unusual and high-quality visual resources, such as badlands, mountainous terrain, steep slopes, natural drainages and waterways, interesting patterns of vegetation, and rock formations that play a dominant role in characterizing a particular scene in the context of the surrounding landscape.

The primary reference and method for identifying visual resources and significant impacts for this assessment was the BLM's Visual Resource Management (VRM) system (BLM 1978). The VRM system provides a standardized procedure for identifying, evaluating, and classifying visual resources for land management purposes.

The VRM system uses three primary factors in determining the compatibility of proposed developments with the existing natural landscape:

- The inherent scenic quality of the landscape features (visual resources) being viewed

- The sensitivity of the visual resources according to public exposure and public concern

- The viewing distance of the resources from areas of human use and viewing points

Once inventoried for these three factors, each BLM planning area is divided into subunits that can be uniformly characterized and assigned a visual management classification. There are five VRM classification designations (Table 3-5), ranging from highly valued, pristine landscapes to areas where human modification has so disturbed the natural setting that they need rehabilitation.

Because a portion of the project (alternative transmission line T4) is on lands managed by the Forest Service, the second primary reference for this study is the Visual Management System developed for Forest Service use, described in Agriculture Handbook 462 (U.S. Forest Service 1974). The Forest Service inventories its lands and classifies them according to character types, variety class, and sensitivity level, and develops visual quality objectives (VQO) for each area. The five VQO management levels are defined in Table 3-6.

The basis of the visual impacts assessment is the project's compatibility with the VRM objectives identified by the BLM-Chaco Planning Unit Management Framework Plan (September 1981), the Chaco Planning Unit VRM evaluation, and the Forest Service VRM system evaluation for the southern portion of the study area. The assessment involved a three-phase effort: a screening process, the completion of the VRM contrast rating, and an evaluation of impact significance of specific project-related changes to landscape character.

Table 3-5. VISUAL RESOURCE MANAGEMENT CLASSES FOR BUREAU OF LAND MANAGEMENT LANDS

Class I	- This class provides primarily for natural ecological changes; however, it does not preclude very limited management activity. Any contrast created within the characteristic environment must not attract attention. It is applied to wilderness areas, some natural areas, wild portions of the wild and scenic rivers, and other similar situations where management activities are to be restricted.
Class II	- Changes in any of the basic elements (form, line, color, texture) caused by a management activity should not be evident in the characteristic landscape. A contrast may be seen but should not attract attention.
Class III	- Contrasts in the basic elements (form, line, color, texture) caused by a management activity may be evident and begin to attract attention in the characteristic landscape. However, the changes should remain subordinate to the existing characteristic landscape.
Class IV	- Contrasts may attract attention and be a dominant feature of the landscape in terms of scale; however, the change should repeat the basic elements (form, line, color, texture) inherent in the characteristic landscape.
Class V	- Change is needed or change may add acceptable visual variety to an area. This class applies to areas where the naturalistic character has been disturbed to a point where rehabilitation is needed to bring it back into character with the surrounding landscape. This class would apply to areas identified in the scenic evaluation where the quality class has been reduced because of unacceptable cultural modification. The contrast is inharmonious with the characteristic landscape. It may also be applied to areas that have the potential for enhancement, i.e., add acceptable visual variety to an area/site. It should be considered an interim or short-term classification until one of the other VRM class objectives can be reached through rehabilitation or enhancement. The desired visual resource management class should be identified.

2. Areas of Critical Environmental Concern for Scenic Values. The ACEC for scenic values are lands of high scenic value of relative scarcity. For this reason, priority identification must be made for presentation in the management framework process. Conformance with VRM Class II objectives constitutes interim management.

Source: BLM Manual 8400.

Table 3-6. VISUAL QUALITY OBJECTIVES FOR U.S. FOREST SERVICE LANDS

Preservation (P)	Provides for ecological changes only.
Retention (R)	In general, human activities should not be evident to the casual visitor.
Partial Retention (PR)	Human activities may be evident but must remain subordinate to the characteristic landscape.
Modification (M)	Human activities may dominate the characteristic landscape but must, at the same time, use naturally established form, line, color, and texture. Development should appear as a natural occurrence when viewed in the foreground or middleground.
Maximum Modification (MM)	Human activity may dominate the characteristic landscape but should appear as a natural occurrence when viewed as background.

Source: U.S. Forest Service 1974.

1. Through the screening process, sensitive visual resource areas and critical viewing points were identified for detailed analyses.

2. The second phase of the assessment was to complete the standardized VRM contrast rating evaluation for the critical areas identified and for each project component within the "seen area" of the sites. In order to better understand the extent of visual contrast likely to result from various project-related consequences, two methods were used for simulating visual change: a photographic technique and a computer-generated graphic technique. The VRM contrast ratings are used to determine the relative change to each landscape element for each of the project components. This rating scheme allows the reviewer to identify exactly which features would result in the highest visual contrast.

3. The last phase of the visual assessment--following the screening process, contrast rating, and simulation --is the final determination of significance. The VRM system provides guidance for determining the extent of contrast. Further indicators for judging significance include the duration of the the consequence, the potential for reasonable mitigation, and the sensitivity of the change in terms of public interest. For purposes of this study, visual consequences considered to be of short duration (from 2 to 5 years in areas of low to moderate sensitivity) or in areas with limited public exposure were considered insignificant. Additionally, in areas where other development (e.g., approved coal mining, gas exploration) is likely to affect the existing baseline condition in the near future, the visual consequences of the NMGS were considered in the context of overall development and landscape modification.

CONSTRUCTION/OPERATION, MAINTENANCE, AND ABANDONMENT

The proposed plant site is located on 2400 acres of land that has a VRM Class IV rating (low sensitivity and "common" scenic quality). According to the BLM-VRM objectives, this means that modifications may be a dominant feature in terms of scale; however, the change should repeat the basic elements of form, line, color, and textural interest in the characteristic landscape. Form, lines, and color of the plant facilities would contrast with the dominant horizontal, gently rolling, open terrain that characterizes the foreground, middleground, and background of the site landscape (Figure 3-1). According to BLM guidelines, the total contrast rating for any feature in a VRM Class IV area should not exceed 20. The contrast rating compiled for the proposed plant site would be 25. Realizing that the VRM objectives are designed to provide a broad-based, standardized evaluation format that is primarily oriented to preserving natural landscape characteristics, an activity on the scale of NMGS could not do other than dominate the natural features in the setting. Since contrast objectives could not be met, the VRM class would revert to VRM V, implying a temporary classification until rehabilitation could occur. Therefore, visual impacts resulting from the construction and operation of NMGS would be significant.

The critical viewpoints of the plant would be from the highest point within the Bisti WSA (a 3-mile viewing distance) (Figure 3-2) and the De-na-zin WSA (6-mile viewing distance). Natural topographic relief would mask all but the top third of the boiler stacks from the selected viewpoint located centrally within the Bisti WSA. The higher elevations and distant perspectives from the observation point in the De-na-zin WSA would give the viewer an almost full view of the plant to the southwest against the Chuska Mountain range. This perspective forms the background for a number of scenic views from within the WSA. The unnatural form and line of the plant structures and the light reflective color (tan) would contrast with the dark-banded Chuska Mountains background in the scenic views to the southwest from the

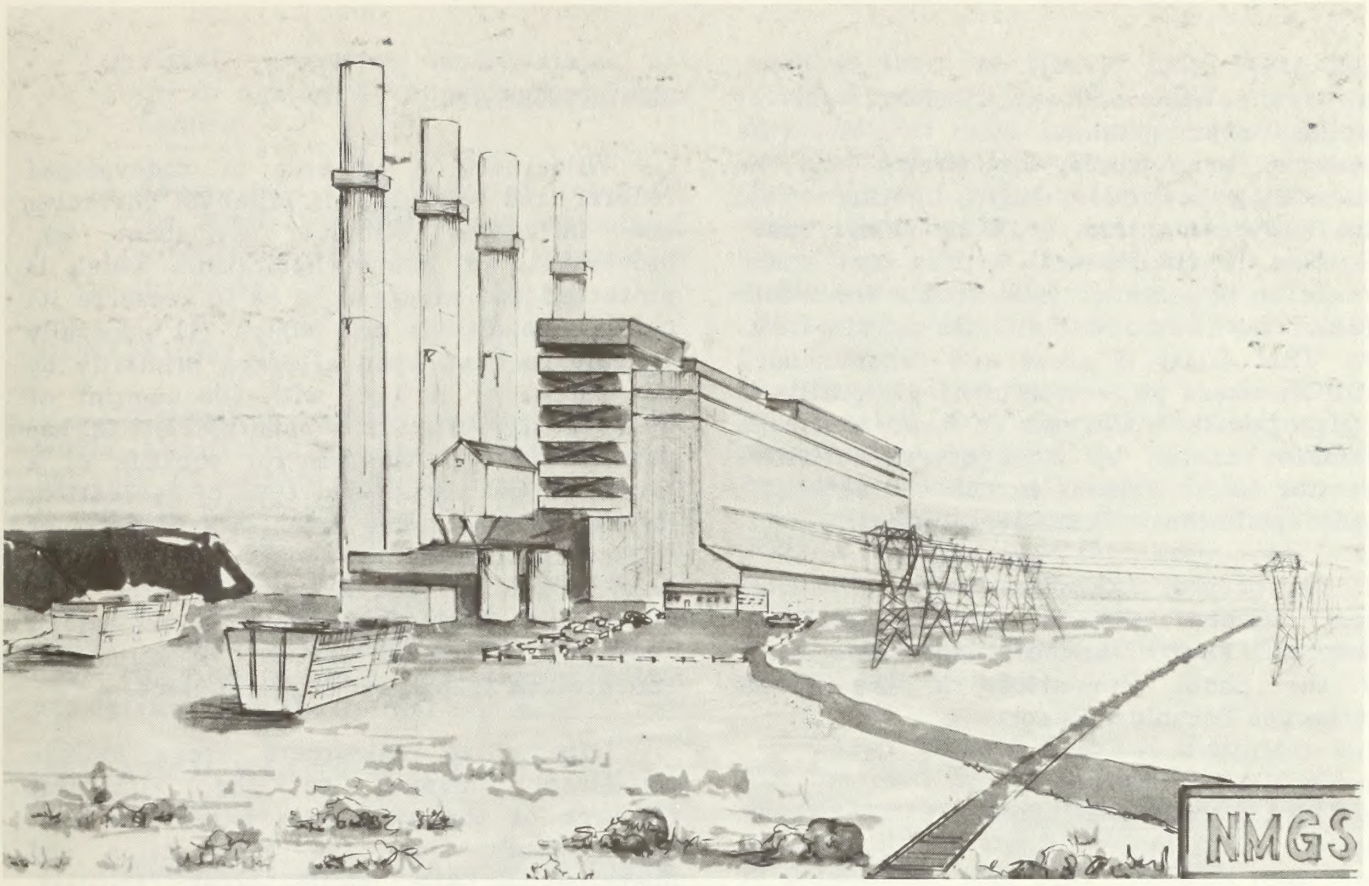


Figure 3-1. NMGS, WEST APPROACH AS VIEWED FROM NM 371

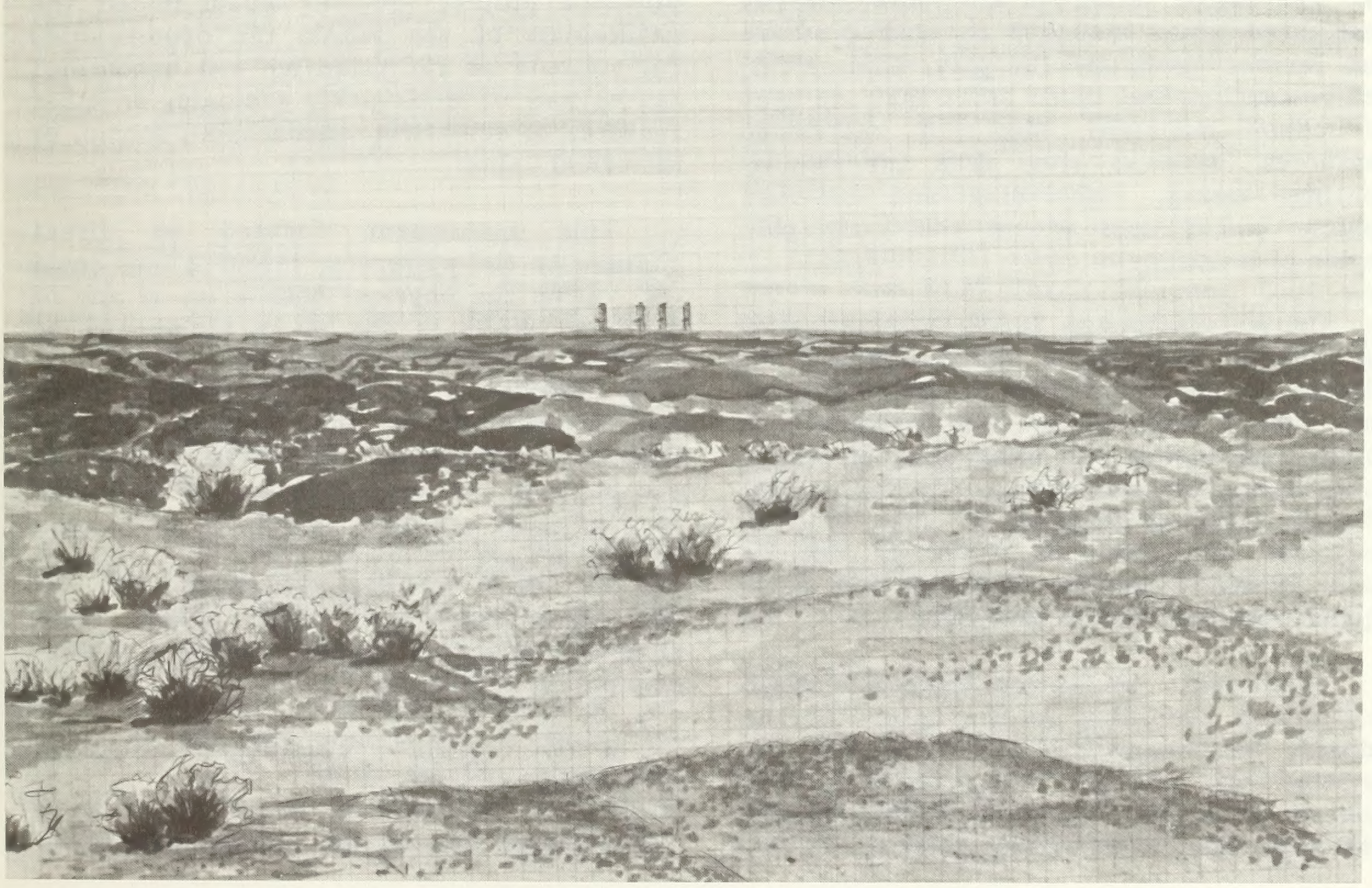


Figure 3-2. NMGS FROM BISTI WSA

De-na-zin WSA. On days when stack or cooling-tower plumes were visible, the viewer's eye would be drawn to the contrasting features. Night lighting would also draw attention to this human modification in the natural setting and would create an illuminated field visible from both WSAs. Both the Bisti and De-na-zin WSAs are VRM Class II areas and recommended ACECs, where protection of scenic quality is a high priority. Changes in basic landscape elements caused by management activities are not to be evident in the characteristic landscape in these VRM Class II areas.

No part of the plant would be visible from either Chaco Culture National Historical Park or any of the outliers (refer to the photo simulations in the Visual Resources Technical Report).

RECREATION AND WILDERNESS

RECREATION

Recreation resources are those formally designated areas managed to both preserve and further their use for play, amusement, and relaxation, and those areas that are used as unmanaged and dispersed recreation resources (such as sites used for fishing, hunting, hiking, sightseeing and off-road vehicle [ORV] use) within the geographic region of influence.

Critical factors in the determination of significance include the direct and indirect effects on the recreation resources (use of land and water, and disturbance to vegetation, habitat, or outstanding landscape characteristics); and changes to the quality of the recreation experience (such as from increased noise, reduced visibility, odor, or from increased activity demand and subsequent overcrowding of facilities).

Significant recreation impacts were determined according to the nature of the impact, the magnitude of change, and the duration of change. Short-term consequences lasting less than two visitor seasons were generally considered insignificant.

WILDERNESS

Wilderness is an area of undeveloped federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least 5000 areas of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition, and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.

Impacts to wilderness areas include significant changes to the wilderness resource or the wilderness experience that would result from the construction and operation of the NMGS plant facilities, transmission lines, or water system. The basic indicator is whether any of the proposed project features would impair the naturalness of the WSAs; the opportunities for solitude or for primitive and unconfined recreation; or ecological, geologic, or other features of scientific, educational, scenic, or historical value.

This assessment focused on direct changes to the wilderness resource that could fall within the physical boundaries of any of the nine WSAs in the study region and on project-related consequences outside the WSA boundaries of such magnitude as to significantly affect the qualities of the wilderness experience related to naturalness and solitude. Other consequences identified for this study are directly related to changes in visitor use resulting from the proposed project. Most potential consequences to the wilderness resources would result from changes identified within other technical disciplines, as follows:

- Air quality--visibility reduction, plume height
- Noise--increase in ambient noise level

- Visual resources--modifications of scenic quality, illumination from night lighting

- Recreation--availability of resources for similar primitive and unconfined activities reduced as population increases

CONSTRUCTION

Construction activities spanning 14 years would significantly detract from the experience of solitude that is so prevalent and is directly tied to the quality of experience reported for the Bisti WSA. Noise from heavy equipment used at the construction site and from the increased number of vehicles traveling to and from the site would draw attention to the construction activities and detract from the natural experience.

OPERATION, MAINTENANCE, AND ABANDONMENT

During operation of the proposed NMGS, the aspect of the project that would have the greatest effect on recreation would be the physical presence of the plant and support facilities (ponds, switching station, etc.). The visual contrast of these structures with the natural landscape surrounding the site would significantly detract from the perception of solitude and naturalness presently experienced.

Direct impacts to the wilderness and recreation resources would include the increased visitor use from the plant work force and associated population growth. Litter, vandalism of cultural resources, fire, and removal of paleontological material could all significantly degrade the quality of the resource.

The participation in camping, picnicking, and hiking as a result of the NMGS project would place additional demands on the already stressed recreation resource base in the project region. With NMGS, the total participation days in camping, picnicking, and hiking in the two-county region would be 54,669 in 1992. NMGS-related population would account for 20 percent, or 10,208 participation days. Some developed sites, such as those at Navajo Lake State Park, could experience an increase in use well beyond their capacity to provide adequate maintenance and supervision of facilities. Problems such as vandalism, fire, increased litter, fighting, noise, and damage to fragile vegetation from unauthorized off-road vehicle use often accompany rapid influxes of visitors who cannot be adequately supervised.

Because the majority of the work force is expected to reside in Farmington area communities, most of the impacts could be expected to occur at Navajo Lake, which is currently experiencing overcrowding. Angel Peak, a BLM-managed recreation area, is one of the closest campgrounds to the Farmington area. The expected increase in use could affect BLM's ability to effectively manage this resource.

Chaco Culture National Historical Park and the Bisti and De-na-zin WSAs would all experience increased use because of their accessibility to the NMGS-related increases in population. The Bisti Badlands represents one of the most unique scenic features in the region, and the Chaco Culture National Historical Park contains a number of the most outstanding and popular archaeological sites. (Mesa Verde National Park is also located within the study region, but it is of sufficient size and distance from the immediate area of influence to avoid significant consequences.) Projections for the year 2000 are that recorded visitor days to archaeological sites on public park lands within the BLM-Chaco Planning Unit will increase from 10,000 per year to 17,000 per year. Total visitor days projected for the BLM planning unit by the year 2000 include 40,872 for sight-seeing and 97,581 for photography. Significant consequences of increased visitor use are similar to those discussed for camping and picnicking, and include vandalism to cultural resources, litter, theft of paleontological material, and degradation to the experience of solitude.

TRANSPORTATION

The objective of the analysis was to assess the adequacy of the existing and planned infrastructure of the air, rail, and roadway network to (1) meet the projected

demands resulting from the proposed action and alternatives and (2) incur temporary disruptions during the construction period. The movement of both supplies and work force to the construction sites and to the operating plant are considered in this assessment.

Rail service in the San Juan Basin is limited to the Santa Fe Railroad along the southern portion of the region. The planned Star Lake-Bisti Railroad would connect the Santa Fe line with the proposed and existing (Lee Ranch) coal mining areas. Since coal for NMGS would come from the neighboring Bisti mine along private haul roads, the focus of this assessment is on the movement of goods and personnel by road.

1. Traffic flow delays in excess of those experienced over the past 5 years on roadways used for movement of construction equipment or personnel (on urban streets, in excess of 900 vehicles per hour)

2. An increase in traffic accidents in excess of those reported for roadways used for movement of construction equipment or personnel over the past 5 years

3. Use of roadways already deficient in safety, surface foundation, or capacity

CONSTRUCTION/OPERATION, MAINTENANCE, AND ABANDONMENT

Although several alternatives and combinations of alternatives are being considered (PNM 1981b), most construction haul routes would use portions of NM 371 and U.S. 666-Navajo 5. The only alternative that for the most part excludes truck transport of materials along NM 371 assumes completion of the Star Lake-Bisti or Con Paso railroad spur project. The railroad spur would provide rail access directly to, or very near, the site of the NMGS. This spur would reduce to a negligible level hauling of equipment and materials to the site by truck along NM 371 or U.S. 666. If the Star Lake-Bisti spur is not used, the continuous movement of materials along NM 371 or U.S. 666-Navajo 5 during the construction phase of the project could cause travel delays along the southern stretches from Interstate 40 and require increased maintenance along the entire route. Travel delays and safety hazards along NM 57 would be most significant during months when visitation is highest at Chaco Culture National Historical Park.

Most persons employed at the NMGS would commute south along NM 371 from Farmington, Aztec, and Bloomfield. The addition of approximately 650 vehicles per day during the peak employment years would affect the traffic flows along this two-lane roadway and could result in safety problems, particularly as commuter vehicles mix with haul trucks. Further consequences related to safety and traffic congestion could occur on NM 44 south of Farmington to Huerfano if project personnel residing in the Bloomfield area chose to commute along County Road 15 to the plant site. This section of NM 44 is already congested with commuter traffic and coal trucks. Degradation of the county road would also result from heavy use, and an increase in accident potential would accompany increased use of this narrow ungraded road. This is considered a significant impact. Increases in road kills of domestic livestock would result from projected increases in traffic volume. These road kills cannot be quantified. It is expected, however, that the magnitude of these impacts would be greatest where the highest densities of domestic livestock coincide with the areas where the greatest increases in traffic volume have been projected.

Two key projects will strongly affect the adequacy of the highway system in meeting the needs of the proposed NMGS. Segments of NM 371 are presently being upgraded so that the entire length from Thoreau to Farmington will be two-lane paved roadway. A series of construction projects to finish this roadway is scheduled to be completed in 1983 (Duffy 1981). If the schedule is met, there would be direct access to the site of the NMGS along a paved two-lane roadway prior to the beginning of construction of the power plant.

A second project that could help to provide adequate roadway access to the

NMGS is the extension of Navajo 5 from the Burnham Trading Post east to a junction with NM 371. Navajo 5 is a paved, two-lane route that runs east from U.S. 666 to Burnham. The proposed junction with NM 371 would be located about 10 miles north of the NMGS, providing a paved route from the railway in Gallup to within 10 miles of the site. Although the survey work is completed, no construction schedule has been proposed for this extension. Completion of these two projects would provide alternative access routes to the site, thereby allowing any impacts on the major north-south connecting roadways to be distributed throughout the system.

Municipal Traffic Consequences

Because of current traffic congestion in Farmington (see the Transportation Technical Report), the construction and operation of the proposed NMGS would make worse an already difficult situation. Preliminary estimates show that 1000 NMGS employees could be located in northern Farmington and Aztec by 1987. To reach the NMGS site, these workers would travel along NM 371. To gain access to NM 371, vehicles represented by these 1000 employees would pass directly through, or very near to, Farmington's central business district during peak hours. The addition of 650 vehicles to crosstown traffic during certain periods of the day could cause a significant increase, from 10 to 20 percent, over baseline traffic flows on key streets in Farmington.

The present configuration of the street system in Farmington would be unable to accommodate the most optimistic projection of traffic-flow increases under baseline conditions, much less the vehicle movement associated with the NMGS. Programmed improvements to the Farmington municipal street system include two projects that might help to relieve the potentially serious traffic problems. Proposals adopted as part of the City of Farmington Major Thoroughfare Plan (1977) but not yet approved by the state include completion of a bypass route south of the central business district. This project would help to reduce congestion in the downtown area by providing a more direct route from U.S. 64 east of Farmington to U.S. 550 and La Plata Highway west of Farmington. Construction would involve extending the Old Bloomfield Highway from its western terminus across the Animas and San Juan rivers to a junction with NM 371. The bypass would continue to a second crossing of the San Juan River and a junction with U.S. 550 and La Plata Highway, a total distance of somewhat less than 4 miles. This improvement would not only facilitate the movement of traffic through Farmington but would also provide better access to NM 371 (the route to the NMGS site) from the eastern portions of San Juan County.

Aside from Farmington, the community of Bloomfield would be most affected by an increase in traffic volume. The hazardous section of NM 44 that extends from the junction with U.S. 64 (near the southern municipal limit) through town would experience further deficiencies in safety and capacity.

SOCIAL AND ECONOMIC CONDITIONS

The following indicators were used to ascertain impact significance for social and economic conditions:

- Projected annual population change in existing communities exceeding 10 percent
- Projected annual increase in employment or income exceeding 10 percent
- 10 percent increase in county or community revenues
- Inability of public sector jurisdictions to meet costs of providing necessary services and facilities to new population prior to receipt of project revenues
- Demand for community services and facilities (housing, municipal services, human services, law enforcement, fire protection, recreation) in excess of projected availability

CONSTRUCTION/OPERATION, MAINTENANCE, AND ABANDONMENT

In general, the construction and operation of the generating station would bolster the economy of the study area and

would create a slight acceleration in projected population growth rates. In addition, it would result in an increase in the demand for housing and other community facilities and services, while increasing the local tax base. The proportion of project- related jobs that Navajos would obtain would depend upon their skill levels and company preferential hiring agreements.

The following list briefly outlines the primary social and economic impacts of the Proposed Action.

Population

- Project-related in-migration would increase the study area's population and would promote the continued growth of local communities such as Farmington, Aztec, and Bloomfield. The largest annual population increase would occur in San Juan County in 1995, when 3400 more people would be attracted to the greater Farmington area as a result of the proposed action. The largest annual population increase in the City of Farmington would also occur in 1995, when an additional 1975 people would seek housing and services in the area. This would amount to a 4.4 percent increase over the projected baseline population.

- The availability of NMGS jobs would reduce the potential out-migration of local residents who would otherwise be unemployed under Baseline 1 conditions are completed in the 1990s.

Economy and Employment

The study area's economy would be stimulated by direct and indirect employment and income, which would result in continued growth and expansion of the local economy. NMGS would add over $780 million to the region in direct and indirect income, with over $75 million in direct and indirect personal income generated in San Juan and McKinley counties in 1992 alone. Construction work force demand would exceed 1600 in peak years. During the operation period, labor requirements are projected to reach 900 jobs. Competition for labor could increase the costs of local goods and services.

It is extremely difficult to estimate Navajo direct employment impacts from NMGS. While Navajo employment has increased in the past decade, Navajo employment rates and income levels continue to be well below comparable U.S. statistics. Minimum rates of unemployment for the tribe during the 1970s were estimated at 30 percent and over. In 1980, the potential labor force (persons 16 years of age and over) comprised 50.4 percent (or 75,030 individuals) of the Navajo population. Of this number, an estimated 60.7 percent (or 45,521) were employed and 39.3 percent (29,509) were unemployed. In contrast, U.S. unemployment rates from 1970 through 1980 ranged from a low of 4.9 percent in 1970 to a high of 8.5 percent in 1975.

It is unknown how many jobs Navajos would be qualified for and it is unknown how many Navajos would apply for those jobs. However, the employment history of the area offers some insight. The Four Corners Power Plant, on Navajo land, had a commitment to preferential hiring of qualified Navajos. At the Four Corners Power Plant there were a large number of applicants and a large percentage of Navajo employment. In 1981, 61 percent of the work force at the Four Corners Power Plant was Navajo. At the San Juan Generating Station there was no commitment to Navajo hiring preference and relatively few applicants, and fewer Navajo jobs resulted. In 1982, 7.2 percent of the San Juan Power Plant employees were Navajo. It may be assumed, therefore, that if there were no preference given to Navajo hiring, there would be few Navajos employed. If, on the other hand, the applicant does commit to Navajo hiring preference, a large percentage of total project jobs would be held by Navajos. Indirect or secondary employment in the local economy may follow past patterns of relatively few off-Reservation jobs out of the total being held by Navajos.

Public Finances

- NMGS would have a positive overall effect on public finances in the affected region's municipalities, even

though projected expenditures would exceed anticipated revenues in some years. Estimated undiscounted cumulative net surplus in municipal operating funds generated between fiscal years 1985 and 2000 (in constant 1980 dollars) would be as follows:

Farmington	$221,000
Aztec	$161,000
Bloomfield	$132,000

Estimated effects on all San Juan County operating funds between 1985 and 2000 (in constant 1980 dollars) would be as follows:

1985	($2,000)
1990	$427,000
1995	$2,060,000
2000	$3,040,000

- The generating station would increase the assessed valuation of affected taxing jurisdictions, thereby generating increased property tax revenues (or decreased tax rates).

- The Farmington Municipal School District would be positively affected by NMGS because the proposed site would be located within this district. In the Aztec, Bloomfield, and Central Consolidated school districts, increased enrollments would necessitate additional expenditures, which would not be fully met by project-related revenues.

Housing

In-migrating NMGS workers would seek housing and other services in the greater Farmington area. The total project-related housing demand associated with these workers and their families is estimated to peak at 1190 units (above baseline projections) in 1995. While there is an abundance of land zoned for residential use in the affected communities, there would be no assurance that housing units would be in place when needed by NMGS workers. Several factors could adversely affect future housing availability:

- Projected housing demand in 1986-87 exceeds the historical housing construction rate in the Farmington area. (In that year, housing demand with NMGS would rise to 1270, as compared to increased demand for 670 units that year without NMGS.)

- Mortgage interest rates are currently very high, and many potential homeowners cannot obtain affordable financing. The future of homeowner financing is uncertain.

- Vacancy rates in the affected region are currently low (estimated to be 3 percent).

Project-related demand could exacerbate a projected shortage of single- and multiple-family housing units, which in turn could increase the cost of housing, as well as the number and proportion of mobile homes in the area. This is considered a significant impact.

Municipal Services

- Project-related in-migrants to Farmington, Aztec, and Bloomfield would only marginally increase each city's projected demand for water; nonetheless, this would contribute to each city's need to acquire additional water rights.

- Project-related demands on community wastewater systems would not exceed projected capacities. NMGS would, however, cause the Farmington wastewater treatment plant to reach capacity 1 year earlier than it would otherwise.

Education

- The in-migration of project-related children would result in a small increase in the demand for teachers in each of the school districts; however, only in the Farmington School District would NMGS aggravate a facility shortage.

Human Services

- At present, most human service agencies in northern San Juan County

are operating at or near capacity, and future funding sources are uncertain. Under these circumstances, increased demand for these services associated with NMGS would result in further strain on these services and a potential decrease in their quality. This is considered a significant impact.

Traditional Values and Lifestyles

- Project-related in-migration would continue to increase the proportion of non-Native Americans in the regional population, which could result in an acceleration of culture change pressures for Navajos. The cumulative effect of ongoing developments in the Eastern Navajo Agency and in-migration of non-Native Americans would result in the reduction of some opportunities for Navajos to adhere to traditional values and to pursue lifestyles based on livestock grazing. On the other hand, the availability of construction and operation jobs to Navajos would increase their opportunities to support relatives who maintain more traditional lifestyles, and to visit "home" more often because they would not have to move far away to obtain wage work. The key factor in determining whether project impacts would be perceived as adverse or beneficial by Navajos is the extent to which they would be employed directly or indirectly as a result of the project (refer to comments under "Economy and Employment"). An additional factor would be the extent to which sacred areas are actually disturbed as a result of project-related population increases.

WATER SUPPLY SYSTEM

PROPOSED ACTION (35,000 Acre-Feet per Year from the Navajo Reservoir [San Juan River])

HYDROLOGY

Operation, Maintenance, Abandonment

Use of the proposed water supply from the Navajo Reservoir would deplete the average annual supply of water in the San Juan River system in New Mexico by 35,000 acre-feet per year (ac-ft/yr). Diversion of this supply at the proposed intake structure (Farmington) or alternative intake structure (Bloomfield) would reduce the streamflow in the San Juan River downstream of the point of diversion by 48 cubic feet per second (cfs) on an average basis. Reductions in streamflow at the proposed and alternative intake sites would not be significant, according to the indicator of significance (less than 15 percent of average streamflow during critical dry periods). During drought conditions, this 48 cfs would be released from the Navajo Reservoir specifically for NMGS. Therefore an additional 48 cfs would be in the San Juan River upstream of the intake structure during drought years. Since this water would be taken in the pipeline, there would be no net change in streamflow downstream of the intake structure during drought conditions.

PNM would divert up to 24,929 ac-ft/yr and use up to 20,000 ac-ft/yr (average discharge of 28 cfs) of water if the recently signed agreement with Utah International is approved by the Bureau of Reclamation. This water might be used in part for projects other than NMGS, but since no uses have been identified, the impacts of those uses cannot be evaluated and all water is assumed to be for NMGS.

The major impact of this water transfer, if the Farmington intake is used, would be a need for the Navajo Reservoir to increase its water releases by approximately 34 cfs during low flow periods to provide for the proposed diversion of 24,929 ac-ft/yr. The reason for this increase is that the Utah International diversion is downstream from the NMGS diversion and its use of the water can be met through return irrigation flows. These return flows are unavailable at the Farmington intake. This increased release is not expected to cause shortages to existing and projected baseline water users as an operations study shows that 48 cfs and 35,000 ac-ft/yr can be released for this intake without causing shortages. The releases are also not expected to cause significant impacts to the operation of the Navajo Reservoir.

Because the Bloomfield intake is upstream of several irrigation return flows (Citizen's Ditch, Hammond Diversion, and

part of NIIP), additional water might have to be released if the Bloomfield intake is used and low flow conditions occur. These additional releases could conceivably reduce the carry-over storage in Navajo Reservoir, which could result in shortages to United States rights in the Navajo Reservoir (NIIP, Hammond Diversion municipal and industrial contracts). Under Public Law 87-483, any shortages to the U.S. rights must be shared equally among the water users in proportion to use, which normally would mean that Utah International would bear shortages in proportion to its 15,000 acre feet of remaining water use, and PNM in proportion to its 20,000 acre-foot use under the agreement. Article 7 of the proposed agreement changes the shortage provision between the two parties and would require PNM to bear all of the curtailment of water deliveries that would be prorated to Utah International up to a maximum diversion of 24,929 ac-ft/yr and depletion of 20,000 ac-ft/yr. This shortage provision in the proposed agreement could result in temporary disruption to the operation of NMGS and will either have no effect on other water users from the Navajo Reservoir or tend to increase overall water supplies. The impact of the interruption could affect both employees and power users. The extent of the impact would depend on the length of the interruption. The availability of water under the agreement is subject, if not extended by the Congress, to termination in the year 2005. If terminated at that time, PNM would either have to develop an alternative water supply, reduce its water use, or curtail operations.

ALTERNATIVE 1 WATER SUPPLY SYSTEM (20,000 Ac-Ft/Yr from Navajo Reservoir and 15,000 Ac-Ft/Yr Ground Water)

HYDROLOGY

Operation, Maintenance, and Abandonment

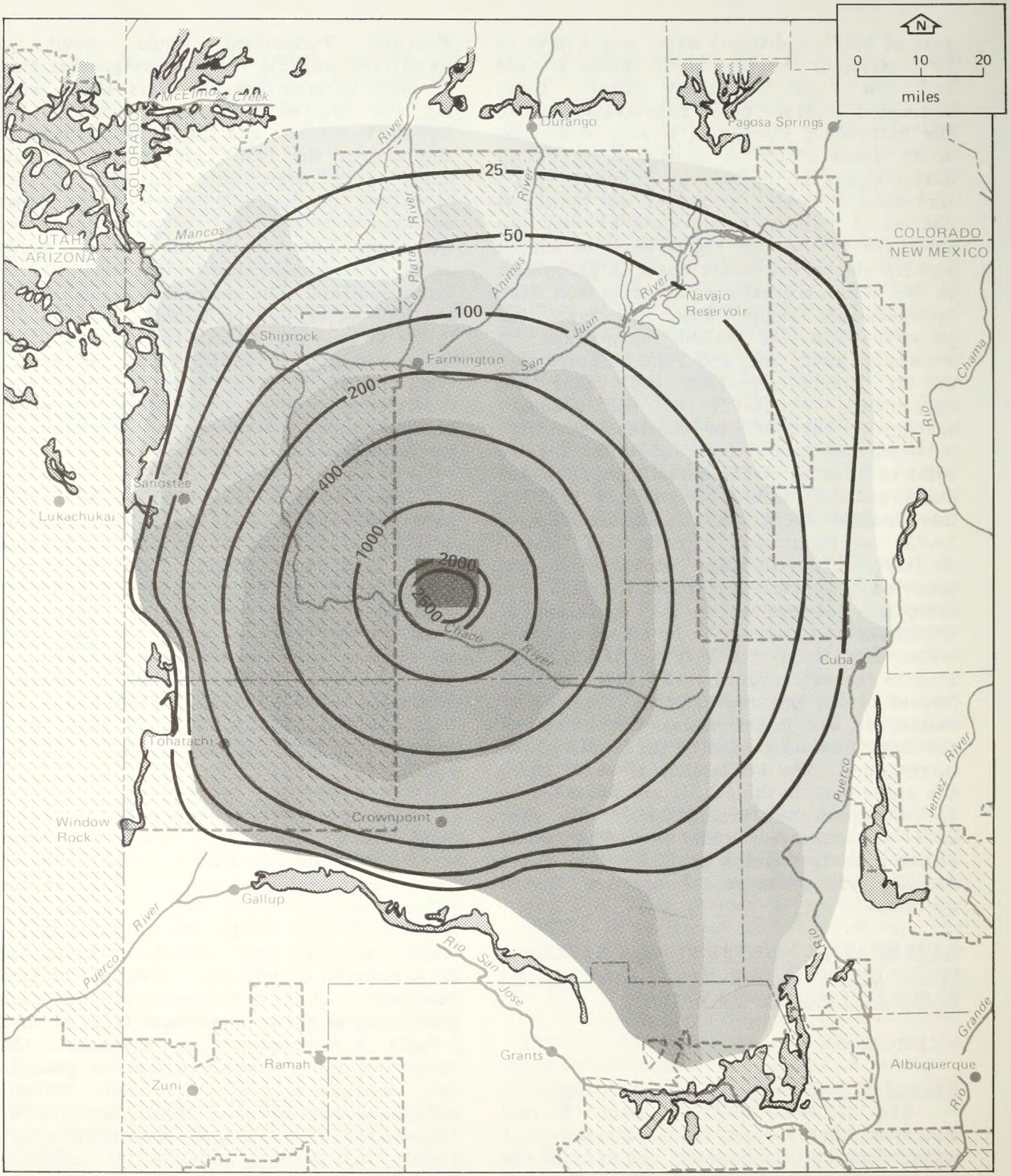
The 20,000 ac-ft/yr from Navajo Reservoir that is part of the alternative 1 water supply system would come from the same assignment of water that was discussed above for the proposed action.

The alternative water supply from the well field (16 wells that would be completed in the Westwater Canyon Member of the Morrison Formation) would result in significant impacts (drawdowns greater than 25 feet) to ground-water users whose wells tap the Westwater Canyon Member, the Dakota Sandstone, and the Entrada Sandstone aquifers in the San Juan Structural Basin (Map 3-2; drawdowns in the Dakota Sandstone and Entrada Sandstone are shown on Maps 4-29 and 4-27, respectively, in the Hydrology TR). Significant impacts would occur over almost the entire basin in all three aquifers. The maximum drawdowns in the Westwater Canyon Member would occur in the vicinity of the well field in year 2033, when pumping for NMGS would be reduced from 15,000 to 6250 acre feet per year (ac-ft/yr). These maximum drawdowns would be approximately 3000 feet in the vicinity of the well field.

The maximum drawdowns in the Dakota Sandstone and Entrada Sandstone aquifers would also occur in the vicinity of the well field used for NMGS. The maximum drawdowns in the Dakota Sandstone would be approximately 400 to 600 feet and would occur in year 2038, at about the time when all pumping from the well field would cease. The maximum drawdowns in the Entrada Sandstone would be approximately 150 to 200 feet and would occur 10 to 20 years after cessation of pumping from the well field for NMGS.

Measureable land subsidence probably would result from withdrawal of ground water from the well field for NMGS. Based on the substantial projected declines in the potentiometric surface of the Westwater Canyon Member aquifer due to pumping for NMGS, the San Juan Structural Basin has been assigned a moderate potential for land subsidence. It is not known whether such subsidence might be significant (greater than 1 foot). A more quantitative estimate of the magnitude or geographic extent of possible land subsidence cannot be made without additional information on rock properties of the aquifer system. Any land subsidence that results from pumping ground water for NMGS most likely would be irreversible.

The duration of significant impacts to ground-water users whose wells are completed in the Westwater Canyon Member, the Dakota Sandstone and the Entrada Sandstone



LEGEND

Indian Reservations

NMGS Well Field

Outcrop includes Morrison, Wanakah, Summerville and Entrada Formations

Time of Maximum Drawdown

- before 2033
- 2034–2038
- 2039–2048
- 2049–2068
- 2069–2108
- after 2109

100 Line of equal drawdown in feet

Map 3-2. MAXIMUM CALCULATED DRAWDOWNS IN WESTWATER CANYON MEMBER OF MORRISON FORMATION DUE TO NMGS

could be 150 years or more after the pumping from the well field for NMGS stops. The duration of drawdowns greater than 25 feet due to pumping for NMGS cannot be accurately quantified with the model used for this EIS.

A beneficial impact of pumping from the well field for NMGS would be a lessening of the dewatering requirements of existing and proposed future uranium mines (Baseline 1 and Baseline 2) by as much as 5 percent. This beneficial impact is judged to be significant.

Pumping the well field for NMGS might cause a significant impact on the flow of springs in the Chuska Mountains. Several springs in the vicinity of the community of Crystal discharge from the Chuska Sandstone where, geologically, the Chuska Sandstone overlies the Westwater Canyon Member of the Morrison Formation. Pumping from the well field for NMGS is estimated to cause a maximum increase of approximately 0.4 cfs in inflow from the Chuska Sandstone to the Westwater Canyon Member. This increased inflow may cause a reduction in the flow of several springs; however, available information on the hydrogeology and average discharge of these springs is not sufficient to quantify whether the reduction in flow would be significant (greater than 15 percent of average daily flow).

Pumping from the well field would also decrease the natural ground-water discharge to the San Juan River, Rio San Jose, Rio Puerco, and Puerco River by an estimated 0.09 cfs. This decrease in natural discharge may be overestimated because ground-water discharge is assumed to be taking place from the Rio Puerco and Puerco River, even though these streams are ephemeral where they cross the outcrops of the aquifer system. (No decrease in discharge to the Rio Salado was identified.) This decrease would not be a significant impact (less than 15 percent of average daily discharge).

This EIS does not evaluate whether the proposed action and alternative water uses for NMGS would impair existing surface-water or ground-water rights in New Mexico. The determination of impairment of water rights is the responsibility and jurisdiction of the New Mexico State Engineer.

The Hydrology TR (p. 4-6) discusses that PNM (Paragon Resources, Inc.) could file a Plan of Replacement with the State Engineer in which Paragon Resources, in effect, would agree to the replacement of water to avoid impairing an existing water right. Replacement of water could consist of "the furnishing of a substitute water supply, the modification of existing water supply facilities, the drilling of replacement wells, the assumption of additional operating costs, the procurement of documentation establishing a waiver of protection by owners of affected water rights, artificial recharge or any other reasonable means to avoid impairment of water rights (72-12A-3, NMSA 1978)." The actions discussed above that could comprise a Plan of Replacement are included in the mitigating measures discussed in Section 8.B.2 of the Hydrology TR. It is not known whether a source for replacement water would be available to allow PNM to file an acceptable Plan of Replacement with the State Engineer. In this event, PNM might have to develop an alternative cooling system or curtail operations.

Summary of Impacts to Indian Ground-Water Users

The extent of ground-water rights of Indian tribes (and non-Indian water users) is being ajudicated as part of the San Juan stream system suit in the District Court for San Juan County, NM. The outcome of this suit conceivably could affect the availability of ground-water for NMGS.

Significant impacts (drawdowns greater than 25 feet) due to use of the wellfield would occur in the Entrada Sandstone, Westwater Canyon Member, and Dakota Sandstone aquifers underlying the Navajo, Jicarilla Apache, Ute Mountain Ute, and Southern Ute reservations. Drawdowns of greater than 1000 feet in the Westwater Canyon Member would occur in an approximately 150-square-mile area in the eastern part of the Navajo Reservation (Map 4-28, Hydrology TR). The maximum calculated drawdowns in the potentiometric surface of the Westwater Canyon Member

aquifer range from approximately 25 to 150 feet on the Jicarilla Apache Reservation (Map 4-28, Hydrology TR).

All existing wells tabulated in the San Juan Structural Basin by the U.S. Geological Survey predicted to have significant drawdowns due to NMGS are tabulated by aquifer in Appendix G of the Hydrology TR. The locations of these wells are given by either the township-range-section system or the Bureau of Indian Affairs quadrangle system. The well locations are also plotted on Plate 1 of the Hydrology TR.

Significant impacts would occur to the wells used for the community of Crownpoint's water supply. The drawdowns in the Entrada Sandstone, Westwater Canyon Member, and Dakota Sandstone aquifers in the vicinity of Crownpoint are shown in Figures 4-9, 4-10, and 4-11 of the Hydrology TR. Note that the impacts (drawdown) due to NMGS are shown in these figures as the difference between the "Case 1" and "Case 2" drawdowns (i.e., the drawdown in the Westwater Canyon Member in year 2040 due to NMGS would be approximately 160 feet [see Figure 4-9]). Future increases in groundwater use by Crownpoint were considered in simulating the drawdowns in Case 1 and Case 2.

The Westwater Canyon Member, Dakota Sandstone, and Entrada Sandstone aquifers are confined (artesian) aquifers throughout most of the San Juan Structural Basin. The water levels in wells that tap these aquifers rise above the top of the aquifers, and wells that tap the Westwater Canyon Member in the west-central part of the Basin flow at present. Water is obtained from these aquifers by a reduction of pressure head (drawdown), but not from physical removal of water in storage in the pores of the aquifers themselves. Although the drawdowns due to the wellfield are shown to be significant, they would not be great enough to lower water levels below the top of the aquifers and cause dewatering. Therefore, these drawdowns or water levels would not approach a critical value, and water still would remain in the aquifers for future use.

Such drawdowns, however, would mean that obtaining ground-water from these aquifers for future use might require increased pumping lifts or equipping flowing wells with pumps. The costs for pumping from greater depths, new pumps, drilling larger diameter wells to accommodate pumps, etc. would be economic impacts to existing and proposed ground-water use by the several Indian tribes, unless these economic impacts were mitigated by the applicant.

Impacts on the flow of springs in the Chuska Mountains in the vicinity of Crystal might be significant due to use of the wellfield for NMGS. A significant impact would be a reduction in the average flow of these springs by 15 percent or more. However, information on the average daily flow of these springs is not available. Detailed hydrogeologic mapping of the area has not been performed to evaluate if the springs issue from the Chuska Sandstone where it directly overlies the Westwater Canyon Member, or if a unit of relatively low permeability separates the two. In the absence of this information, the reduction in springflow must be assumed to be a significant impact.

The use of the wellfield for NMGS would cause maximum decreases in the potentiometric surface of 3 aquifers that underlie the Jicarilla Apache Reservations as follows:

- Entrada Sandstone - less than 25 feet to 50 feet
- Westwater Canyon Member - less than 25 feet to 150 feet
- Dakota Sandstone - less than 25 feet to 150 feet.

These drawdowns in the potentiometric surface are portrayed in Maps 4-27, 4-28, and 4-29 of the Hydrology TR. In general, drawdowns due to NMGS increase across the Jicarilla Apache Reservation from east to west.

Dewatering of these three aquifers would not occur due to pumping for NMGS, even in the immediate vicinity of the wellfield. Water is derived from storage primarily due to elastic compression of the aquifers and to expansion of the water. Oil and gas are derived from petroleum reservoirs by the same processes and, in

addition, expansion of the oil and gas. The decline in the potentiometric surface of the three aquifers may be expressed as a drop in pressure of a static column of water (1 foot of water equals 2.31 pounds per square inch (psi) pressure head). For the Dakota Sandstone, the maximum decline in water pressure on the Jicarilla Apache Reservation would range from less than 11 psi to 65 psi.

The oil fields designated by the New Mexico Department of Energy and Minerals, Oil Conservation Division, that are located on the Jicarilla Apache Reservation are:

- South Lindrith
- West Lindrith
- Chacon
- Five Lakes
- Gallo
- Wild Horse

All of these fields produce from the upper (marine deposits) part of the Dakota Sandstone. The nearest Entrada Sandstone oil fields are located about 20 miles south of the Reservation. These reservoirs are stratigraphic traps and consist of barrier-beach sandstones or offshore barrier-bar sandstones that are lenticular and generally trend northwestward. In some of the fields, the stratigraphy of the reservoir rocks is indefinite, and they may actually belong to the Graneros Member of the Mancos Shale. The driving mechanism for oil production is reported to be "solution gas drive" (Four Corners Geological Society, 1978, Oil and Gas Fields of the Four Corners Area, edited by J.E. Fassett). The permeability of the Dakota Sandstone in these fields is reported to be an average of about 0.1 millidarcy (Four Corners Geological Society, 1978) (equivalent to a hydraulic conductivity for fresh water at 60° F of about 0.0024 ft/day). This equivalent hydraulic conductivity for water is about 3 orders of magnitude less than the value used for the Dakota Sandstone aquifer in the ground-water model used for impact assessment (see p. 4-63 of the Hydrology TR). This difference may result from the fact that water wells that penetrate the Dakota Sandstone aquifer in the southwestern part of the San Juan Basin may be tapping coarser-grained deposits and/or the lower nonmarine part of the Dakota Sandstone.

Part of the Basin Dakota gas field lies within the southern part of the Jicarilla Apache Reservation. This field covers over 1000 square miles of the San Juan Basin, and gas production is from the Dakota Sandstone and Graneros Member of the Mancos Shale. These reservoirs are also stratigraphic traps that consist of northwest-trending continuous barrier beach sandstones. Permeabilities in the Basin Dakota field average 0.15 millidarcy (Arnold and Hill, 1981 [full reference on DEIS p. D-24]). Gas production is reported to be gas expansion drive in upper sandstones and water drive in lower sandstones. "The lower nonmarine section of the Dakota is often wet, either initially or after having been produced for a period of time" (Four Corners Geological Society, 1978, p. 204).

Given the field evidence that water drive is responsible in part for gas production in the Dakota Sandstone, it is conceivable that drawdown in the potentiometric surface of the Dakota Sandstone aquifer due to use of the wellfield for NMGS could result in significant impacts to gas production from the Basin Dakota field. These impacts cannot be quantified without performing a detailed flow analysis that takes into consideration the actual production history and construction details of gas wells in selected areas of the Basin Dakota field. Such data should include pressure declines versus time as a function of gas production.

Since water drive has not been reported as a production driving mechanism for oil reservoirs in the Dakota Sandstone on the Jicarilla Apache Reservation and water production, where reported (West Lindrith field, Five Lakes field), is small (Four Corners Geological Society, 1978), it is likely that there is limited hydraulic connection between the stratigraphic traps in the upper part of the Dakota Sandstone stratigraphic unit and the Dakota Sandstone aquifer to the west and southwest in the vicinity of the proposed NMGS wellfield. Therefore, significant impacts on Dakota Sandstone oil reservoirs on the Jicarilla Apache Reservation due to use of the wellfield for NMGS are not anticipated.

WATER QUALITY

Construction/Operation, Maintenance, and Abandonment

Pumping from the well field would result in leakage from adjacent aquifers with poorer water quality. The leakage could result in maximum TDS increases of about 5 percent in Westwater Canyon Member ground water in the immediate vicinity of the plant site.

VEGETATION

If a reduction of flow from springs would occur, vegetation in the immediate area of the springs could be adversely affected.

WILDLIFE

In addition, wildlife that use the springs and any associated vegetation for water or forage could also be adversely affected.

CULTURAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

An adverse impact to users of the Chuska Mountain springs as sacred sites could result if there would be reduction in the flow.

SOCIAL AND ECONOMIC CONDITIONS

Construction/Operation, Maintenance, and Abandonment

Increased costs to well users would result from the predicted drawdowns due to increased pumping costs or the need to lower well depths.

PROPOSED INTAKE STRUCTURE AND WATER PIPELINE P1

MINERAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Approximately 5 miles of pipeline P1 crosses recoverable coal deposits. It is estimated that about 5 million tons of strippable coal underlies proposed pipeline P1. Since this pipeline would be placed primarily within the existing NM State Highway Department ROW for NM 371, the preclusion of the development of this coal is pre-existing and therefore not attributable to the proposed project.

PALEONTOLOGICAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Significant impacts (e.g., destruction of or damage to fossils) could occur in high-sensitivity zones between mileposts 31 and 33 (Map 3-1). The rest of P1 would cross areas of moderate sensitivity.

SOILS

Construction/Operation, Maintenance, and Abandonment

Potentially significant impacts to the soils resource (e.g., accelerated erosion and reduced productivity) would occur in areas of steep terrain or high wind or water erosion susceptibility (Table 2-8).

HYDROLOGY

Construction

During construction of the proposed intake structure and river diversion site, impacts due to increases in flood elevation and peak discharge of the San Juan River and decreases in recharge to the alluvial aquifer along the San Juan River may occur because of river diversion structures that may be required to construct the intake. Impacts due to changes in flood elevation and peak discharge at the intake sites have not been evaluated quantitatively because the applicant is planning to carefully analyze hydraulic conditions in the vicinity of these sites during final design of these facilities. Recharge to the alluvial aquifer in and adjacent to the channel of the San Juan River during high-flow stages may be decreased by construction activities. Although these potential impacts may be significant, they would be of limited duration, occurring only during construction of the intake structure and river diversion site.

Where proposed water pipeline route P1 crosses De-na-zin Wash, pumping of water from the alluvium of the wash during construction of the pipeline crossing may lower the water level in one well that is completed in the alluvium. This well was

hand dug, and its depth is not known. Since it is probably relatively shallow, the lowering of the water level in this well is judged to be a significant impact. The duration of this impact would be limited, extending several weeks beyond the 14 days (maximum) of pipeline construction at this crossing.

Proposed water pipeline route P1 and alternative routes P2 and P3 would cross other streams, washes, and/or arroyos. Because of the design and construction procedures to be used, significant impacts on flooding potential would not occur (refer to Hydrology Technical Report, Section 6.C). Floodplains of these ephemeral-stream crossings are delineated on flood hazard boundary maps, which are available for inspection at the BLM NMSO.

Operation, Maintenance, and Abandonment

Impacts could occur due to the location of the intake structure and diversion facilities (diked or raised) in the 100-year floodplain of the San Juan River. Impacts could result from changes in flood elevation and in the extent of the existing floodplain up or downstream from the proposed intake. If these changes occurred, structures and environmental features (e.g., stream bed/banks and associated vegetation) could be adversely affected.

An impact on flooding potential due to constructing and operating NMGS is considered to be significant if: (a) a project facility is located in the 100-year floodplain; and (b) the facility increases flood elevations by more than 1 foot (see p. 2-7 of Hydrology TR). Both the proposed and alternative sites for the intake structure would be located in the 100-year floodplain of the San Juan River (see Maps 6-1 and 6-2, respectively, of the Hydrology TR). Details regarding the design of these facilities or regulation of future flood flows by Navajo Reservoir do not currently allow an evaluation of the significance of potential impacts. Without detailed hydraulic analyses, it is not known if elevations of the 100-year flood would be increased by more than 1 foot due to encroachment of 35 acres on the floodplain for the intake structure and river diversion facility. A worst-case analysis has been performed at this time since the more detailed information is not available. The applicant has committed to perform these hydraulic analyses during the Section 404 permit process.

Significant impacts (increases of flood elevations more than 1 foot) are assumed to result from operation of both the proposed and alternative intake structures. These significant impacts may consist of raising flood elevations, increasing the area of inundation, and causing flood damages to structures both upstream and downstream of the river diversion facility. Although these significant impacts cannot be quantified at present, unless mitigation is done impacts are probable. The proposed and alternative intake structures are compared below on the basis of: (1) potential for increases in flooding, and (2) potential for flood damages. As stated above and in the Hydrology and Project Description TRs, the applicant would perform detailed engineering analyses and would submit engineering designs and plans for the river diversion facility and necessary mitigation measures to the Corps of Engineers during the Section 404 permit process.

Flooding Potential. The potential for significant increases in flood elevation due to encroachment of 35 acres in the 100-year floodplain appears to be greater at Bloomfield than at Farmington. Although the widths of the 100-year floodplain at both locations are similar, flow is likely to be more constricted at Bloomfield because there are two islands (one has well established vegetation) in the center of the low-water channel. In addition, flow velocities appear to be higher at Bloomfield because of a greater channel slope than at Farmington and as a result of constriction of river flow by the Highway 44 bridge (a 9-span bridge).

The 100-year flood elevations at the Farmington (proposed) and Bloomfield (alternative) intake locations are estimated as follows: Farmington-5255 feet (msl) (source: Department of the Army, Sacramento District, Corps of Engineers, June, 1975, Flood Plain Information, San Juan River and Tributaries, Farmington, New Mexico: Prepared for the City of Farmington and San Juan County, Plates 8 and 18); Bloomfield-5415 feet (msl) (Source: New Mexico

Highway Department, April, 1982, personal communication between B. Taylor, Environmental Section, and D. Dunbar, Woodward-Clyde Consultants).

Flood Damages - Proposed Intake Structure. No inhabitated structures are located in the 100-year floodplain at the proposed Farmington river diversion site. An oil well and ancillary storage tanks are present at the proposed site of the river diversion facility. The south bank of the floodplain in the vicinity of the river diversion facility is thinly vegetated (brush) except near the bank of the low-water channel (Russian olive and tamarisk). Even without construction of the intake structure, much of the area on the north and south banks are shown to be inundated by a 100-year flood (Department of the Army, Sacramento District, Corps of Engineers, 1975, Plate 8). The area on the north bank upstream of the Animas River consists of cultivated fields and an area that lies fallow. An open-sided storage building is located in the center of this agricultural area. The north bank of the low-water channel of the San Juan River adjacent to this agricultural area is diked; however, parts of this dike may be overtopped if the 100-year flood elevations are increased in the vicinity of the proposed intake structure.

The Farmington sewage treatment plant is located near the San Juan River floodplain on the north side of the river, downstream of the confluence with the Animas River. The location of the sewage treatment plant is approximately 2000 feet downstream of the proposed intake structure and is surrounded by a dike with a crest elevation of about 5256 feet (msl) (Note: 100-year flood elevation at sewage treatment plant is approximately 5250 feet). Therefore, it is highly unlikely that the proposed intake structure would induce flooding impacts at the sewage treatment plant.

WATER QUALITY

Construction

Construction of the water supply diversion facilities at the proposed intake site would cause short-term increases in the turbidity and suspended solids levels of the San Juan River immediately downstream from the headgate construction activities. Similar turbidity increases would be expected if an alternative location for the intake structure were chosen.

Operation, Maintenance, Abandonment

The withdrawal of up to 35,000 acre-feet of water from the San Juan River would increase average levels of total dissolved solids (TDS) downstream along the Colorado River. These increases (a maximum of 4 mg/l at Imperial Dam, or less than 1 percent of the total TDS levels at Imperial Dam) would increase the net cost of Colorado River water use for Lower Basin users due to increased treatment costs (see the Water Quality Technical Report). The Bureau of Reclamation views these TDS increases, resulting from the salt-concentrating effect, as an allowable result of each state's use of available Colorado River system water. Similar downstream TDS increases would be expected if an alternative location for the intake structure were chosen.

VEGETATION

Construction

No significant impacts were identified because the amount of riparian vegetation removed would be small and no locally unique or rare species would be disturbed.

Operation, Maintenance, Abandonment

Loss of existing riparian vegetation downstream of the proposed intake is not expected because no appreciable decrease in minimum flows downstream of the intake would occur (Hydrology Technical Report).

It is also unlikely that natural replacement of riparian vegetation, particularly cottonwoods, would be diminished due to reductions in peak flow. Reductions of annual overflows and natural channel movements have been reported to curtail the formation of cottonwood seedling habitat (Ohmart et al. 1977). However, an average 48 cfs reduction in stream flows of 3700 cfs or more would be less than 1.3 percent of a reduction in peak flows and would probably not result in observable impacts to replacement of riparian habitat. Stream flows of 3700 cfs were exceeded 10 percent of the

time between 1963 and 1981 at the Farmington gaging station below the mouth of the Animas River (USGS 1981b). During heavy runoff years, peak flows of approximately 10,000 cfs have been maintained for up to 7 days. If flood protection would be required up or downstream from the diversion facility as a result of any modifications to the 100-year floodplain, it is possible that additional riparian vegetation would be disturbed.

Impacts to livestock grazing would be primarily short-term due to forage production for approximately 4 years until perennial vegetation can be reestablished within the pipeline ROW. Long-term impacts to livestock grazing would be limited to small areas with permanent facilities such as booster stations. Neither short-term or long-term impacts are considered significant because the forage production loss is primarily short-term and is relatively small compared to the region of comparison.

WILDLIFE

Construction

If construction activities are scheduled during the period December 1 - March 31, when mule deer are concentrated on crucial winter range, disturbances could add winter stress and displace animals from the construction area.

Operation, Maintenance, Abandonment

Impacts to this mule deer crucial winter range would include long-term (i.e., greater than 5 years) removal of browse species used for survival on winter range. Impacts to crucial winter range were not identified as significant impacts according to the indicators of significance defined in Appendix D because less than 1 percent of the regional winter range would be disturbed.

Based on projections of water flow in the San Juan River presented in the Hydrology Technical Background Report, impacts to aquatic biota would be:

- A potential beneficial impact to the trout fishery between Navajo Dam and the proposed NMGS intake because of an increase in the amount of water (i.e., 48 cfs) during periods of low flow. This quantity of water would not maintain the trout fishery by itself, but it would contribute to the minimum required. This same potential would occur in the warm-water fishery downstream of the trout fishery. Because flows between the Navajo Dam and proposed intake structure would be maintained, this stretch of the San Juan River would become more heavily exploited. Future increases in stocking may be necessary to maintain a fishery, and the quality of the fishery may decline.

There would be no effect on aquatic biota below the intake site because flow rates below the intake structure would not be significantly altered on an average basis.

The operation of the NMGS intake would not be expected to result in long-term significant impacts to fishery resources as a result of impingement and entrainment. The fishery in the vicinity of the intake is not considered to be highly valued, and is of local importance. The fish fauna is dominated by carp and suckers.

THREATENED AND ENDANGERED SPECIES

Construction/Operation, Maintenance, and Abandonment

Mesa Verde Cactus. Potential impacts are identified for Mesa Verde cactus (Threatened and Endangered Species Technical Report). If this species is present within potential habitat along the P1 corridors, impacts could include:

- Direct destruction of unidentified populations or individuals
- Accelerated erosion in areas supporting the species
- Removal of local populations by cactus collectors

Bald Eagle. As a relatively common winter resident in the vicinity of the proposed intake structure, the bald eagle is often associated with San Juan River riparian habitat and depends on fish in the river as part of its prey base. No impacts to this riparian habitat or prey base are expected because no appreciable decrease in San Juan River

minimum or peak flows would occur due to proposed water withdrawal for the NMGS. Detailed discussion of this topic is contained in technical reports for hydrology, vegetation, and wildlife resources.

Colorado River Squawfish. No impacts are identified for the Colorado River squawfish because the species has been extirpated in the vicinity of the proposed intake.

Devil's Claw Cactus. No impacts are identified for this cactus because its distribution is limited to north of the San Juan River.

CULTURAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Construction of the proposed water supply system would have significant direct adverse impacts to cultural resources due to disturbance or destruction of subsurface sites. However, once built, maintenance of the proposed intake would probably have few additional adverse effects.

ALTERNATIVE INTAKE STRUCTURE AND PIPELINE P2

MINERAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Approximately 5 miles of pipeline P2 crosses recoverable coal deposits. It is estimated that about 5 million tons of strippable coal underlies alternative pipeline P2. The BLM Chaco-San Juan Management Framework Plan decision precludes the usurpation of coal resources by linear projects such as pipeline P2 (i.e., PNM could be required to relocate the pipeline or compensate the lessee).

PALEONTOLOGICAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Significant impacts (e.g., destruction of or damage to fossils) could occur in high-sensitivity zones between mileposts 33.5 and 35.5 (Map 3-1). The rest of P2 would cross areas of moderate sensitivity.

SOILS

Construction/Operation, Maintenance, and Abandonment

Potentially significant impacts to the soils resource (e.g., accelerated erosion and reduced productivity) would occur in areas of steep terrain or high wind or water erosion susceptibility (Table 2-8).

HYDROLOGY

Operation, Maintenance, Abandonment

Water Users. Use of the alternative point of diversion at Bloomfield may result in shortages to users of water from Navajo Reservoir during a severe drought period. There is a low probability that such shortages would occur; however, the magnitude of these shortages cannot be estimated with the operations model of the San Juan River system used in this impact analysis. The basis for predicting these possible shortages is that water from irrigation return flows of other diversions from the San Juan River would not be available at Bloomfield, whereas some of these return flows would enter the river upstream of Farmington. The duration of these possible shortages probably would be several isolated or consecutive months during a severe drought period.

Flood Damages. See discussion for Proposed intake structure.

Flooding Potential. Several man-made facilities, including inhabited structures, are located in the 100-year floodplain both upstream and downstream of the alternative intake structure site at Bloomfield. On the south bank of the San Juan River, a mobile home is located approximately 200 feet downstream of the river diversion facility, and a junk car lot and metal building (use unknown) are located upstream between the intake site and the Highway 44 bridge. A water intake and pumping plant is located on the south bank approximately 100 feet upstream of the bridge. Four homes are located in the 100-year floodplain on the north side of the San Juan River upstream and downstream of the alternative intake site, and downstream of the Highway 44 bridge. Several mobile homes are located on the north side of the river within several

hundred feet upstream of the bridge. Any significant increase in flood elevations due to the alternative intake structure could conceivably increase flood damages to these homes that are already located in the 100-year floodplain.

The Bloomfield sewage treatment plant is located about 1000 feet north of the river in the vicinity of the alternative intake site, and a pipe discharging treated sewage effluent into the San Juan River is located at the north bank of the low-water channel. The north bank of the low-water channel is about 5 feet high but would be overtopped by the 100-year flood stage (see Map 6-2 of the Hydrology TR).

As discussed above, the 100-year flood elevation estimated during design of the Highway 44 bridge was 5415 feet. The bridge deck has been built with additional clearance above the 100-year flood elevation (south bank 5433 feet and north bank 5428 feet) (New Mexico Highway Department, 1982).

Several man-made facilities, including inhabited structures, are located in the 100-year floodplain both upstream and downstream of the alternative intake structure site at Bloomfield. On the south bank of the San Juan River, a mobile home is located approximately 200 feet downstream of the river diversion facility, and a junk car lot and metal building (use unknown) is located upstream between the intake site and the Highway 44 bridge. A water intake and pumping plant is located on the south bank approximately 100 feet upstream of the bridge. Four homes are located in the 100-year floodplain on the north side of the San Juan River upstream and downstream of the alternative intake site, and downstream of the Highway 44 bridge. Several mobile homes are located on the north side of the river within several hundred feet upstream of the bridge. Any significant increase in flood elevations due to the alternative intake structure could conceivably increase flood damages to these homes that are already located in the 100-year floodplain.

The Bloomfield sewage treatment plant is located about 1000 feet north of the river in the vicinity of the alternative intake site, and a pipe discharging treated sewage effluent into the San Juan River is located at the north bank of the low-water channel. The north bank of the low-water channel is about 5 feet high but would be overtopped by the 100-year flood stage (see Map 6-2 of the Hydrology TR).

As discussed above, the 100-year flood elevation estimated during design of the Highway 44 bridge was 5415 feet. The bridge deck has been built with additional clearance above the 100-year flood elevation (south bank 5433 feet and north bank 5428 feet) (New Mexico Highway Department 1982).

VEGETATION

Construction/Operation, Maintenance, and Abandonment

Impacts on the natural replacement of riparian vegetation would be the same as those discussed for the proposed intake. However, the zone where impacts could occur includes the additional area downstream from the alternative intake to the proposed intake.

WILDLIFE

Construction

Impacts would be the same as those discussed for P1 and the proposed intake, but the area of impact would differ (Map 2-8).

Operation, Maintenance, Abandonment

Impacts would be the same as those discussed for P1 and the proposed intake, except the impact zone would be modified because the location of the alternative intake is upstream from the proposed intake (Map 2-8).

THREATENED AND ENDANGERED SPECIES

Construction/Operation, Maintenance, and Abandonment

Refer to the discussion for P1 (proposed action).

ALTERNATIVE INTAKE STRUCTURE AND P3

GEOLOGIC SETTING

Construction/Operation, Maintenance, and Abandonment

Steep-sided slopes and high landslide potential in Kutz Canyon near Bloomfield on

route P3 represent significant geologic hazards to construction and operation.

MINERAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Approximately 4.5 miles of pipeline P3 crosses recoverable coal deposits. It is estimated that about 4.5 million tons of strippable coal underlies alternative pipeline P3. The BLM Chaco-San Juan Management Framework Plan decision precludes the usurpation of coal resources by linear projects such as pipeline P3 (i.e., PNM could be required to relocate the pipeline or compensate the lessee).

PALEONTOLOGICAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Significant impacts (e.g., destruction of or damage to fossils) could occur in high-sensitivity zones between mileposts 3 and 16. The rest of P3 would cross areas of moderate sensitivity.

SOILS

Construction/Operation, Maintenance, and Abandonment

Potentially significant impacts to the soils resource (e.g., accelerated erosion and reduced productivity) would occur in areas of steep terrain or high wind or water erosion susceptibility (Table 2-8).

WILDLIFE

Construction

Impacts would be the same as those discussed for P1 and the proposed intake, except that the area where impacts could occur would differ (Map 2-8).

Operation, Maintenance, Abandonment

Impacts would be the same as those discussed for P1 and the proposed intake, except that the impact zone would be modified (Map 2-8).

PROPOSED AND ALTERNATIVE TERMINAL STORAGE RESERVOIRS

THREATENED AND ENDANGERED SPECIES

Construction/Operation, Maintenance, and Abandonment

Refer to the discussion for P1 (Proposed Action).

SOILS

Construction/Operation, Maintenance, and Abandonment

Potentially significant impacts to the soils resource (e.g., accelerated erosion and reduced productivity) would occur in areas of high wind or water erosion susceptibility (Table 2-8). Potential impacts and reclamation problems associated with soils obtained from borrow areas are unknown at this time.

TRANSMISSION SYSTEM

PROPOSED TRANSMISSION LINE T1

GEOLOGIC SETTING

Construction/Operation, Maintenance, and Abandonment

Slumping of banks in the Kimbeto Wash could be a potential hazard to tower structures.

MINERAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Approximately 12.5 miles of transmission line T1 crosses recoverable coal deposits. It is estimated that about 13.8 million tons of strippable coal underlies proposed transmission line T1. The BLM Chaco-San Juan Management Framework Plan decision precludes the usurpation of coal resources by linear projects such as transmisson line T1 (i.e., PNM could be required to relocate the transmission line or compensate the lessee).

PALEONTOLOGICAL RESOURCES

Construction/Opeation, Maintenance, and Abandonment

Significant impacts (e.g., destruction of or damage to fossils) could occur in high-sensitivity zones between mileposts 13 and 65 (Map 3-1).

SOILS

Construction/Operation, Maintenance, and Abandonment

Potentially significant impacts to the soils resource (e.g., accelerated erosion and reduced productivity) would occur in areas of high wind or water erosion susceptibility (Table 2-9).

WILDLIFE

Construction/Operation, Maintenance, and Abandonment

Wildlife habitat removal within the ROW would not constitute a significant impact. Other impacts, such as increased hunting and fishing pressure, human-related disturbances, and disturbance to nesting raptors, would be similar to those discussed for the NMGS facility. The number of raptor nests that could be affected for T1 and other alternative transmission lines is given in Table 1-9. Impacts to wildlife resources would be similar on each of the transmission line alternatives, except where specific differences are noted.

CULTURAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Construction and maintenance of the proposed transmission system including access roads, would have a moderate to minimal direct adverse effect on the culture historical resources if the system were designed to avoid them.

VISUAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

The proposed and alternative 500-kV transmission lines, with 80- to 150-foot-high guyed-vee, lattice-steel, or tubular towers every quarter-mile (approximately) would result in visual contrasts to a majority of landscapes in the area of influence.

The forceful vertical and angular shapes (forms) of the towers would not repeat the natural, more subtle, elements in the landscape and would be a visible technological contrast with the prehistoric roads and architecture, and traditional Native American sites of the region, including those at Chaco Culture National Historical Park. Contrast ratings in "form" range from 8 to 12 for tower structures. The lines of specular conductors would be clearly visible from up to 5 miles away and would result in a dominant feature introduced across the landscape (or skyline). Where study areas parallel existing transmission lines, pipelines, or roadways, the extent of change would be additive, but in most instances impacts would be of less significance than the introduction of a new line in an otherwise natural setting. Because a major portion of the landscape in this region is flat to rolling and vistas are expansive (130 miles), the perspective of the transmission line from ground level would have strong contrasts in both form and line as seen on the horizon against clear blue skies. For perspectives from higher elevations, such as mesas, the line created by the linear conductor cables would slice across the open landscape in unnatural and contrasting patterns.

Visual contrast ratings were completed for sections of the proposed and alternative transmission line study areas that traverse high-quality scenic landscapes and those within areas of high public interest or visibility. The section of ROW between mileposts 90 and 95 would overlap the western edge of Ojito WSA (Figure 3-3). Table 3-7 summarizes significant visual impacts for T1.

WILDERNESS VALUES

Construction/Operation, Maintenence, and Abandonment

The T1 study area includes the western boundary of the Ojito WSA; but under BLM Interim Management Guidelines for WSAs, no transmission line could be located within the WSA. A long-term impact would still occur, because the proposed facilities (150-foot towers and 3- and 4-inch conductor bundles) would change the quality of the scenic experience within the WSA. Since the topography

and orientation of the Ojito WSA would help mask the view from within the unit, the T1 line would not significantly impair the wilderness characteristics. Only the top portion of the four to six towers would be visible from the highest elevations within the WSA (Bernalillito Mesa), looking toward Cabezon Peak to the northwest. This vista point is not one of the primary scenic spots in the study area.

Short portions of T1 would come within 3 miles of the De-na-zin, Ah-shi-sle-pah, and La Lena WSAs. These portions would not significantly impair wilderness characteristics, but they would change the scenic quality of the landscape as viewed from elevated portions along the southern border of De-na-zin, from the southern tip of Ah-shi-sle-pah, and from the northwestern corner of La Lena.

PROPOSED TRANSMISSION LINE T2

PALEONTOLOGICAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Impacts (e.g., destruction of or damage to fossils) could occur in moderate-sensitivity zones from MP 0 to 1 and 20 to 50 (Map 3-1).

SOILS

Construction/Operation, Maintenance, and Abandonment

Potentially significant impacts to the soils resource (e.g., accelerated erosion and reduced productivity) would occur in areas of high wind or water erosion susceptibility (Table 2-9).

VISUAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Table 3-7 summarizes significant visual impacts for T2. The transmission line would be visible from Chaco Canyon NHP to visitors at the Pueblo Alto and Pueblo Pintado sites, diminishing the feeling of isolation. The adverse effect is minimized somewhat because of a 230 kV transmission line already visible from those sites. Because of its larger size, the T2 line would present a greater visual intrusion.

WILDERNESS

Construction/Operation, Maintenance, and Abandonment

The T2 study area overlaps the eastern boundary of Cabezon Peak WSA; however,

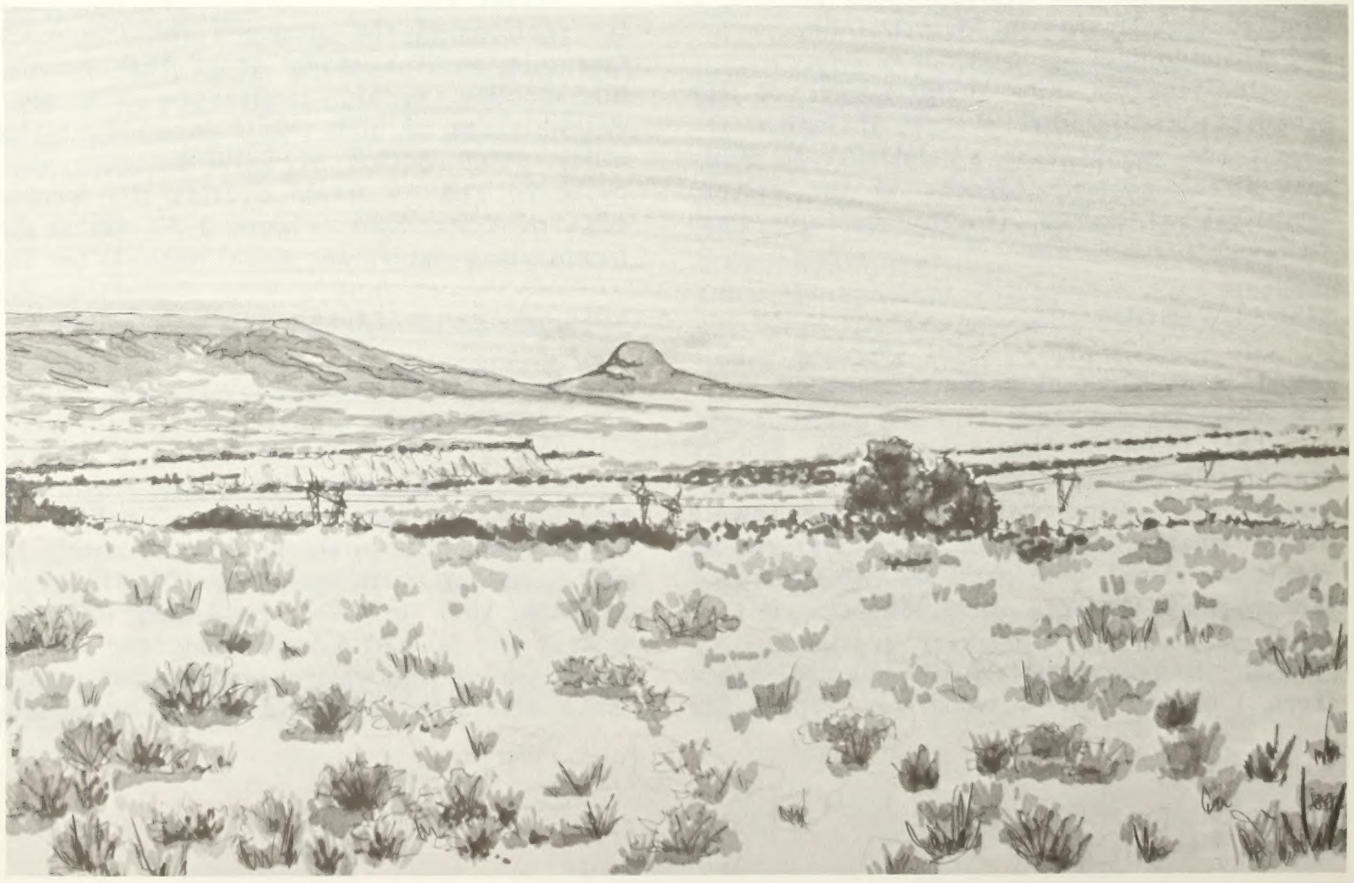


Figure 3-3. T1 LINE FROM OJITO WSA

Table 3-7. SIGNIFICANT VISUAL IMPACTS FOR TRANSMISSION LINE STUDY AREAS

Study Area	Milepost	Contrast Rating	VRM Class/ Allowable Contrast	Notes
T1	0 - 10	23	IV (20)	Borders De-na-zin WSA along county road
	90 - 95	21	II (12)	Overlaps Ojito WSA
	80 - 90	21	IV (20)	Visible from top of Cabezon WSA
				Crosses proposed Continental Divide National Scenic Trail corridor
T2	75 - 85	21	II (12)	Passes within 2 miles of CCNHP Pueblo Alto and Pueblo Pintado sites, and Pierre's site
				Overlaps eastern edge of Cabezon WSA; visible to hikers and photographers
				Crosses proposed Continental Divide National Scenic Trail corridor
				Visible from Ojito WSA
T3	40 - 60	24	II (12)	Crosses below western rim of scenic Chaco Mesa
				Crosses proposed Continental Divide National Scenic Trail corridor
	80 - 85	21	II (12)	Overlaps Cabezon WSA; similar to T2
	90 - 95	21	IV (20)	Visible from Ojito WSA
T4	20 - 25	21	IV (20)	
	65 - 75	21	II (12)	San Mateo Mesa
				Crosses proposed Continental Divide National Scenic Trail corridor

under BLM's Interim Management Guidelines for WSAs, no transmission line could be built within the boundary. Further, the line would have significant scenic consequences as viewed from atop Cabezon Peak. Since one of the primary uses of the WSA is climbing the volcanic plug for a scenic view of the surrounding landscapes, the visual imprint of man's work would impair the scenic and natural character of the view (see Visual Resources).

ALTERNATIVE TRANSMISSION LINE T3

MINERAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

About 2 miles of T3 crosses recoverable coal deposits. It is estimated that about 3.8 million tons of strippable coal underlies T3. The BLM Chaco-San Juan Management Framework Plan decision precludes the usurpation of coal resources by linear projects such as T3 (i.e., PNM could be required to relocate the transmission line or compensate the lessee).

PALEONTOLOGICAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Impacts (e.g., destruction of or damage to fossils) could occur in moderate-sensitivity zones between MP 0 and 1 (Map 3-1).

SOILS

Construction/Operation, Maintenance, and Abandonment

Potentially significant impacts to the soils resource (e.g., accelerated erosion and reduced productivity) would occur in areas of high wind or water erosion susceptibility (Table 2-9).

VISUAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Table 3-7 summarizes significant visual impacts for T3.

ALTERNATIVE TRANSMISSION LINE T4

GEOLOGIC SETTING

Construction/Operation, Maintenance, and Abandonment

T4 would have the greatest potential for landslides or spontaneous combustion of coal that could damage towers and transmission lines.

PALEONTOLOGICAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Significant (e.g., destruction of or damage to fossils) impacts could occur in high-sensitivity zones between MP 0 and 3 (Map 3-1).

SOILS

Construction/Operation, Maintenance, and Abandonment

Potentially significant impacts to the soils resource (e.g., accelerated erosion and reduced productivity) would occur in areas of steep terrain or high wind or water erosion susceptibility (Table 2-9).

WILDLIFE

Construction

If construction activities are scheduled during the periods December 1-March 31, when deer are concentrated on crucial winter range, noise and general human presence could further aggravate winter stress.

Operation, Maintenance, Abandonment

Impacts to mule deer and elk crucial winter range would include long-term (greater than 5 years) removal of browse species critical for survival on winter range. Impacts to crucial winter range were not identified as significant because less than 1 percent of the available range in the regional base for comparison (Appendix D) would be disturbed.

THREATENED AND ENDANGERED SPECIES

Construction/Operation, Maintenance, and Abandonment

Potential impacts to mesa verde cactus are discussed earlier under the proposed intake structure and pipeline P1.

VISUAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Table 3-7 summarizes significant visual impacts for T4.

RECREATION RESOURCES

Construction/Operation, Maintenance, and Abandonment

Alternative T4 would traverse the Cibola National Forest. However, because this alternative would parallel an existing power line and would not cross any of the developed recreation sites or trails, it would not significantly affect recreational activities.

PROPOSED TRANSMISSION LINE T5

PALEONTOLOGICAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Significant impacts (e.g., destruction of or damage to fossils) could occur in high-sensitivity zones between MP 0 and 3.

SOILS

Construction/Operation, Maintenance, and Abandonment

Potentially significant impacts to the soils resource (e.g., accelerated erosion and reduced productivity) would occur in areas of high wind erosion susceptibility (Table 2-9).

THREATENED AND ENDANGERED SPECIES

Construction/Operation, Maintenance, and Abandonment

Potential impacts are discussed earlier under the proposed intake structure and pipeline P1.

RIO PUERCO STATION

GEOLOGIC SETTING

Construction/Operation, Maintenance, and Abandonment

There may be potential for damage or collapse of structures associated with the Rio Puerco substation that may be built over active fault traces in the Rio Puerco fault zone.

NET ENERGY ANALYSIS

The net energy analysis for NMGS considered the three major systems: coal transportation, water transportation, and electricity generation. The major emphasis was on the primary energy flow (coal to electricity), with some discussion of major ancillary energy inputs and energy that would be used in construction. Based on this analysis, the ratio of energy outputs to energy used would be 0.305.

LAND USE CONTROLS AND CONSTRAINTS

The CEQ Regulations require that potential conflicts between the Proposed Action and alternatives and the objectives of approved federal, state, local, an tribal land use plans, policies, and controls be identified. While it would be necessary to acquire a variety of access approvals (see Authorizing Actions, Section 1.2) to implement the Proposed Action and alternatives, these do not constitute conflicts (i.e., non-permissible activities) with existing land use plans or controls.

Approved land use plans in force in the affected area include the BLM Management Framework Plans (MFPs) for the Chaco-San Juan, Rio Puerco, and Cabezon Planning Units. There is also a land use plan in effect for the Cibola National Forest. No conflicts were identified for plans in effect in Cibola National Forest, since the only transmission line alternative that would cross forest land (T4) would be located in an approved corridor. Transmission line study areas for T1 and T2 have potential conflicts with both BLM Management Framework Plans and BLM interim management guidelines for WSAs because of overlap with the boundaries of Cabezon and Ojito. However, since transmission lines would not be allowable under these interim guidelines, there would be no conflict.

The Chaco-San Juan Planning Unit MFP covers the area potentially affected by the

proposed plant site, reservoir, and a portion of the ROWs. The plan provides for BLM consideration of these types of potential uses, based on the stated assumption that the grantee would be responsible for any necessary relocation and other special considerations involved in preserving the values of ACECs. (The Bisti and De-na-zin WSAs and the Fossil Forest are recommended ACECs.)

The Chaco-San Juan Planning Unit MFP also covers the water pipeline ROWs for P1, P2, and P3 and the transmission line study areas for T1 and T3 where they cross recoverable coal deposits. The Chaco-San Juan MFP decision precludes the usurpation of coal resources by these linear project components (i.e., PNM could be required to relocate the lines or compensate the lessee).

From the BLM perspective, use of lands for the proposed NMGS would not result in any conflict with existing land use controls and constraints. In March 1982, BLM proposed that the lands proposed for the Ute Mountain Land Exchange be withdrawn in order to segregate the lands for a proposed exchange with Paragon Resources. From the Navajo perspective, use of this land for the proposed NMGS could be perceived as a potential conflict with Navajo tribal plans and policies for use of these lands, in that this action would preclude their option to acquire these lands as part of the settlement for the Navajo-Hopi land dispute resolution. This issue is discussed further in the Land Use Technical Report.

ALTERNATIVE STATION SITES

In addition to the Bisti site, the BLM has identified and reviewed over 22 candidate siting areas. The full site review process is described in the Site Selection Technical Report. Of these areas, two, Torrance and McKinley, appeared to have the best prospects as alternatives. The purpose of this discussion is to enable the public and the decision makers to consider the suitability of the Bisti site in comparison to other possible sites (Table 3-8). Visual resources and recreation were not included as topics in the original siting studies. The environmental analysis for these alternative sites is not, however, of sufficient detail that this EIS alone would allow BLM approval of the necessary ROWs for those sites. If the BLM rejects the Bisti site, and if PNM decides to pursue any alternative site that would need BLM ROWs, additional NEPA compliance would be required.

Descriptions of the Torrance and McKinley alternative plant sites follow.

TORRANCE SITE

The Torrance site is located in the Estancia Basin in Torrance County, New Mexico.

Climate/Air Quality

Elevations near this site range from about 6800 to 7000 feet, sloping steadily upward from east to west. The terrain continues to rise steeply to the west and northwest, reaching an elevation of over 10,000 feet at Manzano Peak, about 7 miles northwest of the site. The downslope is more gradual east and southeast of the site. The site area itself is entirely open with no restricted topographic features. However, the Manzano Mountains (extending north-south) are due west of the site, with elevations ranging between 9000 and 10,000 feet. It appears, from observation and the climatological data of the area, that a persistent wind pattern may exist, with the southeast upslope winds during the daytime and northwest downslope/drainage the nighttime and early morning periods. These persistent drainage winds, and the higher terrains to the west, could result in poor dispersion in the area.

Geologic Setting

The site is near or within the Rio Grande rift area, which is an active tectonic rift zone with poorly defined margins and a poorly defined level of geologic activity. A major fault of undetermined capability is located along the crest of the Manzano Mountains. Possible faults are also located along Abo Canyon and Mesteno Draw. Both of these faults are located within 5 miles of the site.

Poor or discontinuous bedrock exposures in the Abo Sandstone were found at or near the site. A widespread and well-defined

Table 3-8. COMPARISON OF SITE ALTERNATIVES

Environmental Resource Topics	Site Alternatives		
	Torrance	McKinley	Bisti
Climate/Air Quality			
Potential for stagnant air conditions based on considerations of terrain and anticipated air circulation patterns	Moderate	Low	Low
Geologic Conditions			
Potentially active faults within 5 miles of the site area	Yes	No	No
Potential for liquefaction or subsidence	Low	Low	Low
Presence of sink holes	Occasional	None	None
Minerals			
Presence of surface or subsurface mineral resource in the site area	No	Yes	Yes
Hydrology			
Water source	Ground water from the Estancia Basin	San Juan River and/or ground water from the Westwater Canyon Member of the Morrison Formation, Gallup Sandstone, and Entrada Sandstone	San Juan River and/or ground water from the Westwater Canyon Member of the Morrison Formation
Potential for ground subsidence that could result from ground-water use	Yes	Yes	Yes
Volume of water recoverable to wells from the potential ground-water source	2.9 million acre-feet	5.0 million acre-feet (Westwater Canyon Member)	5.0 million acre-feet (Westwater Canyon Member)
Average yield of wells that penetrate the potential ground-water source	800 gallons per minute	200 gallons per minute or greater	200 gallons per minute or greater
Water source development based on transmissivity, well spacing, well depths, and pumping lifts.	Characteristics of the basin are fair for development of a ground-water supply	Characteristics of the basin are poor for development of a ground-water supply	Characteristics of the basin are poor for development of a ground-water supply

Table 3-8. COMPARISON OF SITE ALTERNATIVES (concluded)

Environmental Resource Topics	Site Alternatives		
	Torrance	McKinley	Bisti
Vegetation			
Presence of any sensitive or unique vegetation within the site area	No	No	No
Wildlife			
Presence of any crucial wildlife habitat within the site area	No	No	No
Threatened and Endangered Species			
Number of species that occur or have potential habitat in the site area	0	0	0
Cultural Resources			
Survey coverage for cultural resources	No comprehensive surveys for the site	Limited surveys	Extensive surveys
Number of recorded sites	0	Several	> 40 sites
Social and Economic			
Commuting distance to the nearest population center with adequate support in labor force, infrastructure and facilities	65-70 miles (Albuquerque)	50-60 miles (Grants/Milan)	35 miles (Farmington)
Population of nearest population center	331,767 (Albuquerque)	15,200 (Grants/Milan)	35,000 (Farmington)
Major economic activity in the region surrounding the site area	Agricultural	Minerals development/livestock grazing	Coal mining/livestock grazing
Land Use			
Current use of the site area	Agriculture	Livestock grazing	Livestock grazing
Land status of site area	Predominantly private land	State and private land	Public lands

pediment was observed within the site area. Its age is estimated to be 2 million to 4 million years. However, its thicknessown.

No unconsolidated alluvial deposits are believed to underlie the site, thus resulting in a low potential for liquefaction or subsidence. Limestone is said to underlie the Abo Sandstone; however, there are no known solution occurrences in this limestone. The site has a mild to rough topography, with occasional sinkholes.

Mineral Resources

The subsurface of the Torrance site is probably nonmineral in character. The overall suitability of the site is not affected by the presence of mining claims or other subsurface resource-related encumbrances.

Hydrology

The potential source of water supply for the site would have to be from mining of ground water from the Estancia Basin. The basin is a declared underground water basin under the jurisdiction of the New Mexico State Engineer. The basin is topographically closed and is filled with late Tertiary and Quaternary alluvial and lacustrine deposits (valley fill) that overlie Paleozoic bedrock. The relatively flat Estancia Valley occupies the center of the basin and is elongated in a north-south direction. This flat valley floor is interrupted in the southeastern quarter of the basin by playas, which occupy depressions up to 40 feet deep.

The valley fill aquifer of Pliocene to Holocene age is the principal water-bearing formation in the Estancia Basin. Locally, the underlying Pennsylvanian Madera Limestone and Permian Glorieta Sandstone are productive aquifers, due mainly to solution cavities and fractures. The following discussion pertains only to the valley fill aquifer.

The saturated thickness of the valley fill aquifer ranges from zero to 360 feet. The average saturated thickness based on values for each administrative block in the basin is about 200 feet. The volume of ground water stored in the valley fill aquifer is approximately 5.4 million acre-feet. This volume has been computed using values of saturated thickness for each administrative block and a specific yield of 0.125. South of Estancia, about 2.9 million acre-feet of this ground water would be recoverable to wells. The average yield of wells that penetrate the valley fill aquifer is about 800 gallons per minute. Water quality in the western part of the Estancia Basin is good for irrigation but becomes poorer toward the center of the basin.

The principal source of recharge to the valley fill aquifer is infiltration of direct precipitation and intermittent stream flow in the Manzano Mountains and foothils in the western part of the Estancia Basin. The infiltrated water enters the Madera Limestone and eventually recharges the valley fill aquifer by subsurface inflow. The amount of recharge that occurs from precipitation is probably small.

Discharge from the valley fill aquifer occurs principally from pumpage of ground water for irrigation and by evaporation from the playas. A minor amount of ground water is discharged by subsurface outflow from the northern portion of the Estancia Basin to the Santa Fe trough. The largest use of ground water is for irrigation. Most of the irrigation wells that penetrate the valley fill aquifer are located parallel to and west of NM 41. Pumping from this concentration of wells has resulted in a decline in water levels of about 1.5 feet per year.

The State Engineer's criteria for administering new appropriations in the Estancia Basin and the impairment of existing water rights are well defined. According to state regulations, the lowering of water levels in existing wells from additional appropriations in quantities permitted by the State Engineer does not constitute impairment in a ground-water basin that the State Engineer considers to be nonrechargeable.

The hydrologic characteristics of the basin are only fair for development of a reliable and dependable water supply. The saturated valley fill on the average exhibits relatively moderate transmissivity. The relatively small area and saturated thickness of the basin probably are the major constraints to the development of a ground-water supply.

The development of water supply for uses other than agriculture would introduce competition for water in a traditionally agricultural community. The mining of water over a long period would introduce additional adverse effects of potential ground subsidence.

Vegetation

Vegctation on the site is dominated by agricultural species. There appears to be little ecological sensitivity to plant construction and operation activities.

Wildlife

No crucial wildlife habitat is present in the Torrance site area.

Threatened and Endangered Species

No threatened or endangered species are known to occur in the Torrance site area.

Cultural Resources

No archaeological or historic sites are recorded for the site. Records indicate that the site area has not been comprehensively surveyed, nor have any significant surveys been documented for the general surrounding terrain.

The Torrance site is located in the region of the Salinas National Monument. This national monument includes several former New Mexico state monuments which are primarily late prehistoric or early historic pueblos that have been grouped as the Salinas Pueblos. The closest of these to the Torrance site area would be the Abo and Quarai Pueblos, located approximately 10 miles southwest and 4 miles west of the site. In addition, La Cienaga Mission is located about one-half mile north of the site.

Social and Economic Conditions

The site area is not close to any pertinent population; however, it is close to three transient-population generators (Cibola National Forest, Manzano State Park, and Quarai Pueblo).

The site is located southeast of Albuquerque in a predominantly agricultural area. The area is characterized by some grazing and irrigated farming. The area is accessible to Albuquerque by highway with an approximate commute distance of 65-70 miles. Nearby towns include Mountainair, Willard, and Estancia. The area is generally characterized as relatively economically depressed. Should industrial development take place in this region, it is expected that considerable support in labor force and infrastructure services and facilities would have to come from Albuquerque (population 332,000) because of the absence of other nearby population centers that could provide adequate support and facilities.

Land Use

The site is located predominantly on private lands. Most of the land adjacent to and within 5 miles of the site is either private (70 percent) or Forest Service (27 percent) land; 3 percent is state land. Facilities that are in proximity to the site area include an airfield, two highways (including U.S. 60), the Atchison, Topeka and Santa Fe Railroad, a transmission line, two gravel pits, and four gas pipelines.

There are various types of restricted lands in proximity to the site. The western boundary of the site borders on the southwestern portion of the Cibola National Forest. Almost all of the land immediately east of the site is private except for small scattered parcels of state land. The Quarai Pueblo and Manzano State Park are within 5 miles of the site area.

The site area is part of a relatively isolated, large region that has little, if any, mineral- or resource-related development, and the region has no previous experience in accommodating large-scale industrial development. In the absence of unforseen external influences, land use patterns will be expected to remain relatively unchanged from those that presently exist.

McKINLEY SITE

The McKinley site is located in McKinley County, New Mexico, just north of the continental divide.

Climate/Air Quality

The elevation of the McKinley site ranges from about 6500 to 6700 feet. The site terrain rises gradually from north to

south. A small peak rises to an elevation of 6900 feet to the south. However, this site generally has an open appearance. The continental divide rises only about 200 feet above the site elevation. The highest elevation along the divide is 8150 feet at a distance of about 15 to 20 miles south of the site. Chaco Mesa is east to northeast of the site at a distance of about 10 miles. There appear to be no major topographic features that would adversely affect dispersion at the McKinley site.

Geologic Setting

The McKinley site is in the Chaco Slope, which forms the edge of the tectonic province, the San Juan Basin. There are no identified local faults or folds in the area. Bedrock exposures containing numerous resistant sandstone outcrops are present at the site. Consolidated alluvial deposits are not known to underlie the site, thus alleviating concern for liquefaction or subsidence at the site. Additionally, soluble deposits are not known to underlie the site.

Mineral Resources

In the McKinley site area, most of the subsurface rights for exploration and production for uranium, coal, oil, and gas have mostly been conveyed to several major energy companies. Some private mineral rights may subsequently have been leased to other parties. There are no known plans for development of these resources in the near future.

Soils Resource

Poorly defined patchy soils were found within 5 miles of the site. The soils in the vicinity of the McKinley site are estimated to be 300,000 years or younger in age.

Hydrology

Potential water supply would come from either the San Juan River or development of a well field that taps the principal sandstone aquifers in the San Juan Basin. A water supply system utilizing San Juan River water would be similar to that discussed for the proposed NMGS site near Bisti.

The principal sandstone aquifers in the vicinity of the McKinley site are the Gallup Sandstone, the Westwater Canyon Member of the Morrison Formation, and the Entrada Sandstone. Availability of ground water from a well field would depend largely on the number, spacing, and depth of wells.

The principal aquifers in the San Juan Basin are confined and range in depth from less than 200 to more than 3000 feet. The average height of the potentiometric surface of these aquifers is well above the top of the aquifers (available drawdown). Yields of individual wells of 200 gallons per minute or greater are possible because of this large available drawdown of the potentiometric surface. Because the transmissivity of individual aquifers is relatively low, wells probably would be spaced several miles apart to avoid interference and excessive drawdowns. Approximately 5 million acre-feet are estimated to be potentially recoverable from the Westwater Canyon Member. Water quality of the aquifers in the basin is variable and ranges from good to poor, depending mainly on well depth and distance from recharge areas.

The major constraints to the availability of ground water from a well field in the San Juan Underground Water Basin are related to complex legal issues. There is uncertainty in the overall quantity of ground-water appropriations that will be permitted by the State Engineer because that office's criteria for administering the San Juan Underground Water Basin are not completely defined.

Vegetation

The McKinley site is in a semiarid area. Vegetation is dominated by grasses, forbs, cacti, and individual scattered pinyon pine and juniper.

Wildlife

No crucial wildlife habitat is present in the McKinley site area.

Threatened and Endangered Species

No threatened or endangered species are known to occur in the site area.

Cultural Resources

No comprehensive archaeological surveys have been conducted for the McKinley

site area; however, several limited surveys have been conducted in the general vicinity and have resulted in recording a few archaeological sites. These sites range in type from Archaic lithic scatters to Anasazi (Chacoan sites and later Mesa Verde type remains) to historic sweat lodges and hogans. In addition, a large cultural resource inventory was conducted 1 mile north of the site area. Nine archaeological sites (historic Navajo and fire pit sites) were recorded in this inventory. Thus, the potential for locating archaeological resources in the course of any detailed follow-up field survey at the McKinley location is high. No historically significant features or structures have been recorded within this site.

Social and Economic Conditions

From a demographic standpoint, there are few people within 5 miles of the site. Geographically, it is within 30 air miles of the Grants-Milan area, which has had considerable impact by mineral development activities. In the recent past, however, the economic activity related to uranium mining has slowed considerably. The labor force required would be drawn from a sparsely populated area defined by a 75-mile commuting radius. The nearby community, Hospah, is located about 11 miles due northeast. The nearest population center, Grants/Milan (population 15,200) is about a 50-60 mile commute by automobile. The social and economic impact of plant construction and operation would be that associated with rapid population growth and decline. Grants and Milan, the nearby municipalities, would be the focal point of demand for housing, supplies, and community services.

Land Use Controls and Constraints

The site area is located primarily on state and private land. Generally, the land in the site region is about 65 percent private, 28 percent Navajo, 5 percent state lands, and 2 percent BLM-managed public lands.

Facilities near the McKinley site area include two airfields, a power transmission line extending in a north-south direction near the site, Interstate 40, and the Atchison, Topeka and Santa Fe Railroad located about 25 miles south of the site.

HEALTH AND SAFETY

POTENTIAL HEALTH AND SAFETY EFFECTS OF POWER PLANT EMISSIONS

Ambient air quality standards have been established by both the EPA and the NMEID. These standards are mandated by the Clean Air Act. As stipulated in the act, the national ambient air quality standards have been established to protect human health and general welfare with an adequate margin of safety.

Results from public scoping meetings for the EIS indicated that there is public concern about the effect of the proposed power plant on air pollution and the resulting effect on human health. In addressing these concerns, the air quality analysis examined the predicted total concentration levels resulting from the project and compared these levels with the respective state and national standards. Because predicted total concentration levels are not expected to exceed these standards, public health and welfare would not be endangered by the operation of the proposed plant, according to Clean Air Act standards and definitions.

ACCIDENTS

The possibility of health and biological hazards from electric fields is of public concern, but the potential effects are unclear. A large number of research projects, articles, reports, and books that address the biological effects of power-frequency electric fields were initiated and published during the 1970s. The Electric Power Research Institute (EPRI) alone has funded seven major projects on the health and biological effects of electric fields (EPRI 1980). A recent report, Electrical, Biological, Health, and Safety Effects of the APS/SDG&E Interconnection Project (BLM 1980, Appendix E) was prepared to analyze potential impacts and provides a comprehensive summary and review of current literature on the subject. The following discussion is summarized from the BLM report.

The majority of recent studies have reported that no effects have been observed. A small percentage of studies have reported

effects, particularly studies that have investigated long-term exposure to electrostatic fields. Several of the studies reporting effects have been criticized for deficiencies in experimental procedures. The operating experience of utility companies in the United States should also be considered. The absence of observed long-term effects due to electric field exposure was documented in a survey of seven electric utilities and no documented cases of harmful biological effects have ever been received by the Bonneville Power Administration (BPA).

The results of studies reported to date are therefore inconclusive in establishing whether biological health effects do occur. In addition, when such effects have been reported to occur, experts are not in agreement that they constitute a potential biological or health hazard.

PIPELINE RUPTURE

A rupture of a concrete pipeline such as the one proposed for the NMGS water supply system would generally result from outside forces and not from internal pipeline pressure or corrosion. The potential for rupture due to internal forces is extremely low. If internal forces caused a rupture, the break would manifest itself in the appearance of wet spots on the ground surface, which would be identified during routine line patrols. Any necessary repairs would be made after taking the line out of service.

Presented in the analysis below are representative scenarios for pipeline accidents and the impacts that would be expected. These scenarios are based on worst-case conditions and assume the proposed P1 alignment. There are no important differences in number or significance of impacts for any of the pipeline alternatives.

Breakage at Blowoff or Air Valve Structures

Water could be released by vandals breaking into blowoff or air valve structures and opening valves. Blowoff valves would be located in low spots along the line and would discharge more water through larger pipe and at higher pressure than air valve structures and opening valves. Blowoff structures would be located at natural drainage channels, so the effects of water discharged from them would be minimal. Release of water from air valve structures, which would be located at intermediate summits, would flood the surrounding area to a small extent and would probably cause minor local surface erosion.

Discharge from a fully opened valve at a blowoff structure at Hunter Wash (MP 31.4 and MP 32.3) could be as much as 12 cfs. This discharge from a single blowoff structure would be about 90 percent of the output of a single pump in each pumping plant. The loss of water would not be sensed at any of the pumping plants. Notification from the patrol crew or from passersby would be the only effective means of detecting damage downstream of the pipeline crossing. Flow from the blowoff structure at MP 5.7 (<8 cfs) might flood the area upstream of Ojo Amarillo Lateral Canal, and if not detected early might overflow the canal bank. Flow from the blowoff structure at MP 7.0 (<8 cfs) would enter Ojo Amarillo Canyon.

Rupture in Manifolds on Pump Discharge Lines

Although no rupture is known to have occurred in manifolds on pump discharge lines similar to the design for the NMGS water supply system, the effects of such an event at one of the four pumping plants were analyzed. This occurrence would represent a worst-case condition.

Intake Pumping Plant

A pipeline break at the intake pumping plant would be detected by operators within a short time, so all the pumping plants could be shut down. The water in the pipeline between the intake plant and booster plant No. 1, amounting to about 33,000 cubic feet, could drain out through the break. Up to 10 minutes could elapse before the pumps could be shut down. Water in the pipeline would be evacuated in about 4 minutes. A total of up to 50,000 cubic feet of water could be discharged in the yard area of the intake pumping plant at an initial rate of about 43 cfs.

Booster Plant No. 1

Assuming a maximum rupture similar in size to that assumed for the intake plant, the pipeline at booster plant No. 1 could lose about 73,000 cubic feet of water in about 33 minutes after the rupture occurred. The

maximum rate of outflow from the break would be about 30 cfs. Water probably would flow down the arroyo that discharges downstream of the intake works.

Booster Plant No. 2

A break in the discharge manifold for booster plant No. 2 of the size of the one described for the intake plant would initially discharge water at the rate of about 30 cfs. The 158,000 cubic feet of water in the pipeline between booster plants 2 and 3 would then be released in about 53 minutes. Water would flow into one of the small drainage courses that eventually enter the badlands about 2 miles northeast of booster pumping plant No. 2.

Booster Plant No. 3

Under conditions similar to those described for the other booster plants, a break at booster plant No. 3 could release 82,000 cubic feet of water, at 31 cfs, in about 34 minutes. Water would enter one of the washes near booster plant No. 3 and flow northeasterly 2 or 3 miles to the badlands on the westerly side of Moncisco Wash.

EMERGENCY PROCEDURES

Identification and control of emergency conditions along the main water pipeline route would be the responsibility of the intake plant operator. The control center at the intake plant would be attended 24 hours a day, 7 days a week. Instruments would continuously monitor pipeline pressures and pump status at each intermediate pump station. Instruments would sound alarms any time a deviation occurred in pressure or flow, indicative of an outage or unusual condition in the pipeline system. Indications of an outage could come from any of several sources: a telephone call from a member of the public, a radio alert from an aerial patrol pilot, or an alarm from the instruments. Upon receiving a report from any of these sources, the operator would immediately implement emergency procedures. The first priority would be to secure the area to reduce the possibility of damage to persons or property.

RESERVOIR FAILURE

Possible modes of reservoir failure, the consequences of reservoir failure, and the time rate of failure are considered in this section. The probability that the reservoir might fail is not assessed, although it is expected the probability would be low, based on sound engineering design and quality control. No important differences between the reservoir alternatives were found.

Three failure modes for the reservoir are considered possible:

- Overtopping of the embankment
- A slide through the embankment
- Internal erosion or piping, either through the embankment or through the embankment foundation.

Overtopping of the embankment is not likely because positioning of the embankment on a natural ridge would limit inflow to the reservoir from precipitation and runoff to essentially that which would be directly incident to the reservoir area. In addition, a spillway would prevent the reservoir from rising significantly above the full reservoir level in the event that the pumps supplying the reservoir failed to shut down when the reservoir was full. This same spillway would protect the embankment from overtopping as a result of precipitation and runoff.

If the embankment were to fail by piping, it is expected that wet areas would first appear either on the downstream slope of the dam or near the downstream toe. The rate of increase of flow through the dam would be dependent on the materials with which the dam was constructed and how they were placed in the embankment.

A slope failure, or slide through the embankment, would cause reservoir outflow generally similar to that described for a piping failure. However, there might not be observable phenomena preceding a slope failure. Piping and slope failure would be expected to have comparable consequences.

Failure due either to piping or sliding near the maximum dam section would be the worst case for analysis. Either type of failure might result in a peak discharge approaching 50,000 cfs which would empty the reservoir in a few hours. Since the reservoir embankment would extend around most of the reservoir perimeter, the location

of a possible embankment failure would determine the impact area.

That section of the embankment where failure would cause outflow into the Chaco River drainage would be less than 20 feet high, so failure of the embankment in that area would release only a part of the water stored in the reservoir. Since the Chaco River channel near the reservoir is broad, the largest conceivable outflow from the reservoir probably would not cause a flow more than a few feet deep. Further, channel storage and riverbed percolation would act quickly to dissipate the flood wave as it passed down the channel.

If the embankment failed in a section which would cause outflow toward De-na-zin Wash, reservoir release would exceed the capacity of the natural drainage channel. However, for about the first 3 miles downstream, the terrain has a general slope of about 100 feet per mile so overtopping of the channel would have no significant consequences.

About 5 miles below the dam the flow would enter De-na-zin Wash. In this area the wash is broad, with a slope of about 20 feet per mile. It is expected that the peak flow in the wash in that area would not be deeper than 10 feet. The broad channel of De-na-zin Wash would be expected to quickly dissipate the peak flood wave released from the reservoir. There are no significant developments, nor are any expected, in or near the De-na-zin channel and therefore no significant damages nor threats to life would be expected. However, roads and the coal conveyor which cross De-na-zin Wash might be damaged.

SPILLS OR LEAKAGE ASSOCIATED WITH ON-SITE AND OFF-SITE DISPOSAL OF LIQUID AND SOLID WASTES

Various liquids associated with the plant water management system (Project Description Technical Report) could be spilled or leaked into the ground during power plant operation. In addition, spills or leaks could result from the storage or use of such chemicals as sulfuric acid or caustic soda. Spills or leaks may also result from the storage and disposal of plant wastewaters in the evaporation pond and runoff in the coal-pile runoff and storm drainage pond. In general, surface spills from project activities are not expected to reach the downslope environment (De-na-zin Wash) because the coal-pile runoff and storm drainage pond would act as a collector of surface spills upslope in the plant area.

It is expected that the design features of the evaporation ponds and the coal-pile runoff and storm drainage pond would limit the seepage of stored liquids into underlying zones (refer to the Water Quality Technical Report). To assure that net seepage is low, a leak detection system would be installed as part of the evaporation pond system, while monitoring of existing ground water with monitoring wells could detect leakage away from the coal-pile runoff and storm drainage pond (refer to the section titled Suggested Mitigation).

NO-ACTION ALTERNATIVE

If NMGS were not constructed and operated, the impacts associated with it would not occur. Since it is possible that PNM would have to supply electricity by other means, an analysis of the possible consequences of this alternative was conducted. The level of analysis provides a benchmark against which the consequences of the Proposed Action can be weighed in the public review and decision-making processes.

Further information and references for these discussions of impacts are contained in the Technical Report on Alternatives to the Project.

COAL CONVERSION

A coal-conversion-generation facility, assumed to be located at the proposed Bisti site and to use San Juan Basin coal, would involve converting coal to medium-Btu gas and burning it in a combined-cycle gas turbine/steam turbine, using steam produced from the hot gas turbine exhaust. The primary environmental concern is the safe disposal of large quantities of solid wastes that would be produced, as well as treatment of liquid waste streams. Water requirements

would be similar for both, but a larger construction work force would be needed.

For these environmental reasons, coupled with the fact that a full-scale coal conversion plant has not yet been built, it is likely that such a plant would be more complex than a conventional coal-fired plant with no apparent environmental or cost advantages.

DECENTRALIZED SYSTEM

Since each individual coal-fired power plant in the decentralized system would be smaller than NMGS, the local environmental effects around each plant site would be less than with NMGS, in the absence of unusual local conditions. The combined environmental effects for the whole system with regard to air quality, water use and quality, and solid-waste disposal would be comparable to those for NMGS. Impacts on any one community would be less with a decentralized coal-fired steam electric system. The plants would be smaller and would be built at different time periods or different locations. Work-force-related demands on community infrastructure and services would be reduced, as would revenue benefits to affected jurisdictions. The total electric energy generated would be similar for the two alternatives, but operating experience shows that smaller plants are generally no more efficient, or are less efficient, than larger plants.

Each plant in the decentralized system would require a mode of coal delivery and electric transmission line(s). Depending on the water sources, more than one water supply ROW might be required. The environmental effects of these ROWs would depend on the specific locations of the plants.

GEOTHERMAL PLANT

The major environmental issues in geothermal power production are airborne emissions, solid wastes, brine disposal, subsidence, water use, and hydrologic changes. Other issues include noise, chemical or thermal pollution of surface and ground waters, land and ecosystem disturbance (e.g., erosion, sedimentation), and short-term climatic disturbances. The environmental effects are highly site-dependent.

The airborne emissions of greatest concern are hydrogen sulfide and trace metals. Hydrogen sulfide has an offensive smell and is very toxic at high concentrations. Its release has historically been a problem at geothermal plants.

The management of spent hydrothermal fluids is a key issue, since most are very saline and cannot be discharged into surface or ground waters. The anticipated disposal scheme is to inject the spent fluids back into the geothermal reservoir, but scaling and plugging are sometimes a problem with very saline fluids. Treatment of the spent fluid would produce large quantities of sludge, which would require careful disposal.

The removal of large quantities of fluid from a geologic formation may result in subsidence, or sinking of the land. Also, the withdrawal and injection of geothermal fluids may increase the rate of microseismic events.

Use of a geothermal reservoir for production of electricity would probably require exogenous sources of water for the heat rejection system. The amounts needed could be similar to that needed for an NMGS-type conventional coal plant.

Social and economic impacts associated with a geothermal plant would be less substantial than those identified for NMGS, because work-force size would be smaller, multiple power plant units would be developed sequentially, with each 50-MW unit requiring a work force of approximately 300 during construction and 100 during operation. The Baca site in New Mexico for geothermal development has met with significant resistance from Native American and environmental groups. Conflicts over water and with Native American lifestyles are the principal reasons for this opposition.

NUCLEAR POWER

Nuclear power plants produce radioactive isotopes (fission products). Some of

these may escape into the reactor cooling system because of defects in the cladding material. Also, structural materials, coolant-borne materials, and corrosion products are made radioactive by radiation produced during the fission process. Liquid radioactive wastes are produced from excess reactor coolant, collected drainage, leaky valve stems and pump seals, and so forth. In normal operation, these and other wastes are packaged and disposed of in accordance with safety regulations.

Normal operation of commercial light water reactors results in release of small quantities of short-lived radioactive gases and airborne particulates.

Spent fuel from an operating nuclear reactor is highly radioactive, which poses hazards to public health and safety. Because spent fuel is highly radioactive and its radioactivity persists for a very long time, it requires permanent isolation from the human environment. Current national policy is to develop mined geologic repositories to provide this isolation. This would involve placing the spent fuel in deep, geologically stable rock formations. Substantial evidence has been accumulated over the past 25 years to support the technical feasibility, economic practicality, and safety of such an approach. However, no such repositories are currently in operation.

Currently, spent fuel is being accumulated in on-site storage at commercial power plants across the country. Within the next 5 years, the U.S. Department of Energy estimates that some plants will run out of storage space. Decommissioning of a nuclear power plant must be done in a way that protects public health and safety. The primary ways of decommissioning a facility are (1) "mothballing," which involves removing all fuel and selected radioactive components and placing the facility in protective storage; (2) entombment, which consists of removing all fuel and selected components and sealing the remaining major radioactive components within the shielding structure; and (3) removal/dismantling, which consists of removing from the plant site all fuel and components having radioactivity above predetermined levels.

The construction work force with a nuclear plant would be larger than the anticipated NMGS work force, resulting in higher projected in-migration and greater demand for community infrastructure and services. Operations staff would be smaller. A nuclear facility could increase the projected tax base in affected jurisdictions more than NMGS.

The mining of coal necessary to operate a coal-fired facility usually involves disturbance to a large area of land. Uranium mines, however, are typically underground and disturb a relatively small amount of land.

OUT-OF-STATE POWER SOURCE

Potential out-of-state sources of electricity are likely to be either coal-fired or nuclear plants. The environmental effects for any such plant would depend on the specific type of plant and the characteristics of the site where it was built. Overall, the environmental effects could be greater or less than those for NMGS.

An out-of-state power source would displace social and economic impacts from northern San Juan County to other states, if construction of new electrical generating facilities is required.

RENEWABLE RESOURCE ALTERNATIVE

This combination strategy might involve use of the following: conservation, large and small hydroelectric, central-station solar-thermal electric or photovoltaic municipal solid waste, central-station wind, agricultural and forestry wastes, and wood-fired generation. The renewable-resource alternative would disperse social and economic impacts over a wider area because of the smaller scale and greater location options associated with renewable-resource developments. The environmental effects of each of these are discussed below.

The environmental consequences of conservation are minor.

For hydroelectric plants, four environmental issues are likely to require detailed site-specific analyses: (1) the need for

upstream and downstream passage of certain species of fish around dams, (2) the effects of water-level fluctuations and downstream flow changes, (3) water quality, and (4) the environmental effects of dredging.

The primary determinants of whether fish passage will be a significant issue at a particular site are the fish species, habitat conditions upstream from the dam, and regulatory requirements. For those fish species whose life cycle includes migration for spawning, blocking migration by a dam can have significant consequences.

Water-level fluctuations resulting from releases required for peak power can adversely affect both reservoir and down stream ecosystems. Potential water quality issues include alteration of temperature regimes, reduced turbidity, changes in dissolved oxygen, increases in certain dissolved metals, and altered nutrient and organic matter regimes. Potential adverse impacts due to dredging include loss of primary production and stress to fish from increased turbidity and destruction of bottom aquatic habitat, and secondary effects on aquatic biota.

Central-station solar-thermal electric or photovoltaic systems would require construction on relatively large areas of land, with potential for land use conflicts and disturbance of local ecosystems.

Municipal Solid Waste

Environmental issues associated with central-station wind plants include: (1) safety, both public and occupational, during construction and operation; (2) electromagnetic interference, particularly to nearby television receivers; (3) noise; and (4) the aesthetic and land use problems of siting very large towers. Minor issues include bird collisions, ice throwing, lightning danger, and potential aircraft hazards.

Agricultural and forestry wastes might be directly burned or converted to a liquid fuel such as alcohol. The environmental effects of direct burning would be similar to those for wood-fired generation, which is discussed below. Environmental issues associated with biomass-derived alcohol fuel arise from biomass production, conversion to alcohol, and electricity production.

The most significant potential problem related to biomass production is erosion due to removal of wastes that would otherwise help to hold soil fertility and affects air quality, water quality, and ecological communities.

Conversion of biomass to alcohol by biochemical or thermochemical means produces various emissions that may cause environmental problems. Thermochemical process emissions include particulates, nitrogen and carbon oxides, ammonia, and hydrocarbons, as well as oils, phenols, and polynuclear aromatic hydrocarbons. Biochemical processes produce sludges with high biochemical oxygen demand. If applied to the land, these can introduce unconverted organic material, minerals, and inorganic salts into local water supplies and cause a buildup of salts in the soil. However, much of this sludge can be dried and sold as cattle feed.

The environmental, health, and safety issues related to wood-fired generation are not well known. Areas of particular concern are gaseous and particulate pollutants, residue disposal, and safety. Other issues related to harvesting, transportation, handling, and storage systems include nutrient depletion in forest lands, emissions during wood handling, leachate from wood storage, soil erosion stream sedimentation, impact on ecosystems, land use competition, and occupational accidents in wood harvesting.

Many factors influence the atmospheric emissions from wood burning, but the pollutants of concern include particulates, carbon monoxide, nitrogen oxides, hydrocarbons, polycyclic aromatic hydrocarbons, phenols, aldehydes, potassium, calcium, and aluminum.

ALTERNATIVE USES OF SAN JUAN BASIN COAL

If NMGS is not constructed and operated, the San Juan Basin coal proposed for use would ultimately be used for other purposes. These uses could include export

out of the area for use elsewhere or use within the San Juan Basin for another industrial facility. Impacts associated with these possibilities could be similar to those for NMGS, depending on location and type of use.

DELAY-OF-ACTION ALTERNATIVE

A delay of action could result from either an agency permitting delay, applicant-initiated delay, reduced demand for electricity resulting in later plant start-up dates, or other action. The delay-of-action alternative was analyzed based on the same affected environment as that for the proposed action. The difference in impacts associated with variations in construction schedule would be the socioeconomic effects in the project area.

In particular, because of the less optimistic outlook of the national and state economies, PNM's load growth projections have been reduced and the schedule for plant construction will probably be delayed. There may be a later construction date for the first unit of NMGS, and a longer time span between construction of the units. For the same reasons, many of the projects included as baseline have been delayed or may be developed at a slower pace than originally planned.

It is possible that the projects considered in the DEIS baseline would continue to experience delays comparable to those associated with the NMGS project. If the state and national economies experience recovery from the recent recession, development of coal mines, oil and gas processing, power plants (including NMGS), and other industrial projects may begin or resume at the rates comparable to those predicted in the NMGS DEIS. In that case, the future "without project" case, and NMGS-related impacts, would be comparable to those described in the DEIS except that they would be postponed by several years. If other projects develop as projected in Baseline 1, but NMGS were to be delayed substantially, impacts would be comparable to those described for the Delay-of-Action Alternative (p. 9-13 of the Social and Economic Conditions TR), except, once again, projected impacts would be delayed by several years.

A more important point is that from a growth perspective the NMGS DEIS represents a maximum socioeconomic analysis, because it includes the assessment of impacts during one period (1986-87) when demand for local labor and community facilities and services associated with both NMGS and other Baseline 1 projects would be unusually high. Thus, it was assumed that more than half of the new NMGS workers needed for plant construction at that time would have to be hired from outside the area. Furthermore, in 1987 an annual increase of 830 workers over the previous year was assumed for NMGS. This represents the largest annual change reflected in the project description information contained in the DEIS, while PNM's delay-of-action work-force schedule shows a maximum annual work-force increase of 690 workers in 2002.

Table 3-9 shows NMGS construction and operation employment estimates, which would result from a Delay-of-Action.

The main points of comparison between the Proposed Action and the Delay-of-Action are as follows:

- In the Proposed Action the highest total direct employment would be 1804 in 1992; in the Delay-of-Action schedule, the highest total direct employment would be 1710 in 2002.

- In the Proposed Action the largest annual increase in employment would be 830 in 1987, and the largest annual decrease would be 560 in 1989. In the Delay-of-Action the largest annual increase in employment would be 690 in 2002 and the largest annual decrease would be 1189 in 1994.

Social and economic impacts associated with NMGS-related employment increases in the Delay-of-Action schedule would be the same or less than those identified in the DEIS and the Social and Economic Conditions TR, since the construction and operation proposal used in the DEIS analysis included higher

Table 3-9. NMGS CONSTRUCTION AND OPERATION EMPLOYMENT, DELAY-OF-ACTION ALTERNATIVE

Year	Intake Pipeline and Reservoir	500-kV transmission Line	NMGS Construction Unit 1	Unit 2	Unit 3	Unit 4	Total	NMGS Operation Unit 1	Unit 2	Unit 3	Unit 4	Total	Total Employment	Annual Change
1990	--	--	85	--	--	--	85	--	--	--	--	--	85	+85
1991	--	--	800	--	--	--	800	--	--	--	--	--	800	+715
1992	115	--	1515	--	--	--	1630	--	--	--	--	--	1630	+830
1993	295	104	1180	--	--	--	1579	--	--	--	--	--	1579	-51
1994	--	--	360	--	--	--	360	30	--	--	--	30	390	-1189
1995	--	--	100	30	--	--	130	200	--	--	--	200	330	-60
1996	--	--	--	450	--	--	450	250	--	--	--	250	700	+370
1997	--	--	--	940	--	--	940	250	--	--	--	250	1190	+290
1998	--	--	--	750	--	--	750	250	--	--	--	250	800	-390
1999	--	--	--	270	--	--	270	250	24	--	--	274	544	-256
2000	--	--	--	105	40	--	145	250	160	--	--	410	555	+11
2001	--	--	--	--	570	--	570	250	200	--	--	450	1020	+465
2002	--	--	--	--	1260	--	1260	250	200	--	--	450	1710	+690
2003	--	--	--	--	955	--	955	250	200	--	--	450	1405	-305
2004	--	78	--	--	325	--	403	250	200	30	--	480	883	-522
2005	--	--	--	--	90	30	120	250	200	200	--	650	770	-113
2006	--	--	--	--	--	435	435	250	200	250	--	700	1135	+365
2007	--	--	--	--	--	940	940	250	200	250	--	700	1640	+505
2008	--	--	--	--	--	775	775	250	200	250	--	700	1475	-165
2009	--	--	--	--	--	255	255	250	200	250	24	724	979	-496
2010	--	--	--	--	--	95	95	250	200	250	160	860	955	-24
2011	--	--	--	--	--	--	--	250	200	250	200	900	900	-55

Source: 1983 PNM data.

peak employment and a larger maximum annual increase. Moreover, the peak employment was projected to occur in a year when other (Baseline 1) projects were also assumed to be generating high employment demand, population increase, and associated need for community infrastructure and services. The most significant difference between the two schedules is that because of the possible delay between construction of units 1 and 2, the revised schedule indicates that NMGS employment would drop more dramatically from 1579 in 1993 to 390 in 1994. The magnitude of the impact of this decrease in worker demand from one year to the next would depend upon the level of employment demand generated by other projects in the study area in 1993-94. If other projects do not need new employees, or are also laying off workers, the number of unemployed workers in the Farmington area would increase substantially. Unemployed workers would probably leave the area if they could not find alternative employment, at least for the two-year period until NMGS employment demand would rise again.

The analysis indicates that NMGS employment increases would not be substantial enough to cause a "boom" in the Farmington area economy. However, the large decrease in projected employment between 1993 and 1994 could contribute to a "bust" situation in the local economy, particularly if other major employers in the area were to lay off substantial numbers of workers in the same year. If regional employment were to fluctuate greatly throughout the 1990s, with delays of more than one year between periods of high cumulative work-force demand, population stability in the area would be affected. With the potential decrease in personal economic security, and an associated increase in population turnover or transience, people in the area could experience more stress-related social and mental health problems.

Delay of the project could also have the long-term effect of reducing the overall environmental impacts of the project. A delay would allow additional time for the development and application of now unavailable technology that could be used to reduce air and water pollution, to increase the efficiency of water usage, to increase the efficiency of coal usage, and other similar improvements.

SUGGESTED MITIGATION AND MONITORING PROGRAMS

Mitigation measures were developed based on findings from impact assessment. Some of these were incorporated by the applicant into their Proposed Action project description (Chapter 1). These were assumed to be implemented for the purposes of the analysis since the applicant would be required to incorporate them into the Plan of Operations. The following suggested mitigation measures and monitoring programs were not assumed for the analysis to be implemented, since it is not known at this time whether they would ultimately be required. Identified agencies (or landowners) that would have jurisdiction, expertise, or interest in a specific mitigation measure are listed in parentheses within the suggested mitigation discussions.

NOISE

It is suggested that, where practicable, equipment be designed to minimize noise. Further, plant layout should incorporate noise barriers, such as plant structures themselves and vegetative screening, which also result in minimization of noise (Occupational Safety and Health Administration).

PALEONTOLOGY

Avoidance of those areas where high to moderate sensitivity of paleontological resources have been identified (surface management agency or landowner).

In lieu of avoidance of direct or indirect impacts to the affected resources, data recovery (i.e., scientifically controlled excavation, analysis, and curation) would provide minimal to adequate mitigation for adverse impacts. Such a recovery program should be developed for areas classified as being of high to moderate paleontological sensitivity within the proposed project areas (Map 3-1).

Major elements of an adequate data recovery mitigation program would include:

- Intensive inventory of proposed project areas preliminarily identified as being of high or moderate paleontological sensitivity to identify any surface-exposed fossils and evaluate their significance.

- Development of a predictive model of significant fossil localities affected by the proposed project to be used as a basis for designing an adequate research strategy and possible construction monitoring program.

- Implementation of a data recovery program. Based on the research strategy, this may involve various levels of recovery intensity (e.g., surface collection, excavation, and collection of units of varying size) keyed to areas of varying predicted distributions of significant fossil remains. This program would include field investigations, laboratory analysis and reporting, and curation.

- Implementation of a construction monitoring and emergency recovery program in areas of predicted occurrence of significant fossil resources. The recovery program could be designed in a manner similar to that followed under nonemergency circumstances.

Mitigative data recovery programs are most effective in offsetting the direct ground-disturbing impacts. Thus they could provide adequate protection of the scientific information value of the fossil materials in areas of high sensitivity. Data recovery in areas of predicted moderate paleontological sensitivity would be most effectively conducted during a construction monitoring and emergency discovery project stage (surface management agency or landowner).

Mitigation of adverse effects caused by indirect impacts of the proposed project is less likely to be adequate. Development of community education projects to enlist local support to protect the fossils in place, complemented by more rigorous enforcement of restrictions on off-road vehicle use in areas of rich paleontological deposits, would provide some protection of scientific values that would otherwise be lost to amateur collectors. Monetary support for an ongoing paleontological research program in the general project area would also offset the losses that might occur through uncontrolled collection or fossil destruction through surface exposure and erosion. A long-range program of project area surface and exposure monitoring and selective data recovery of significant fossils would also provide some resource protection by providing a compensatory data base (New Mexico Institute of Mining Technology, Smithsonian Institution, University of New Mexico, the New Mexico Museum of Natural History, and other universities in the United States).

SOILS

The general types of mitigation measures proposed are:

1. Mulching denuded areas or covering with jute fabric or riprap
2. Topsoiling
3. Drainage control (e.g., waterbars)
4. Reseeding

These measures should be implemented in potential soils reclamation problem areas as detailed in the Soils Technical Report. More detailed descriptions for these mitigation measures are given below, for Vegetation and Range.

BLM reclamation specialists could make an on-the-ground determination of the specific erosion control and reclamation measures to be stipulated. Some disturbed areas (water supply and transmission systems) may not respond adequately to the initial erosion control and reclamation measures that would be implemented following construction. A soils monitoring program should be conducted over the life of the project to identify problem soil erosion/revegetation areas. Once identified, problem soil erosion/revegetation areas would undergo more intensive reclamation and mitigation (e.g., physical stabilization measures and reseeding), thereby helping to ensure that irreversible and irretrievable commitments of the soils resource would not occur (surface management agency or landowner, U.S. Soil Conservation Service).

HYDROLOGY

WELL-FIELD WATER SUPPLY ALTERNATIVE

Significant impacts due to drawdown in water levels in wells of other ground-water users in the San Juan Structural Basin could be mitigated by replacement of water supply, if required by the New Mexico State Engineer. Such replacement of water could consist of the furnishing of a substitute water supply, the modification of existing water supply facilities such as installation of large pumps, the drilling of replacement wells, the assumption of additional operating costs, or artificial recharge (New Mexico State Engineer).

Impacts due to reduction in the flow of several springs in the Chuska Mountains could occur as a result of the well field for NMGS. However, available information on the hydrology and average discharge of these springs is not sufficient to quantify whether the impacts would be significant. A hydrogeologic reconnaissance of these springs to study their occurrence and relation to the Westwater Canyon Member is recommended as the first part of the monitoring program which would help to quantify the potential impacts. The second part of the recommended monitoring program is to establish stations for gaging the flow data periodically to develop a baseline of average annual discharge of these springs.

Measurable land subsidence probably would occur as a consequence of groundwater withdrawals from the well field. Additional information on the rock properties of the affected aquifer system would be required to attempt to quantify this potential subsidence. It is recommended that a relatively small leveling network in the immediate vicinity of the well field be established to monitor for land subsidence. In addition, if the wells in the NMGS well field are drilled, it is recommended that several representative rock samples be collected and analyzed for properties such as shear strength and compressibility. These data subsequently could be used to evaluate whether or not land subsidence due to groundwater withdrawal would be a significant impact.

WATER DELIVERY SYSTEM/WATER PIPELINES AND INTAKES

The significant impact on one well completed in the alluvium of De-na-zin Wash (well 23.13.14.141), in which a lowering of the water level may occur during construction of the water pipeline crossing, could be mitigated by furnishing a substitute water supply. This form of replacement of the water supply probably is the most practical alternative in this case because the duration of the significant impact would be only about 2 weeks.

Significant short-term impacts due to increase in flood elevation and peak discharge of the San Juan River and decrease in recharge to the alluvial aquifer along the river may occur during construction of the proposed or alternative intake structure and river diversion site. The applicant is planning to analyze hydraulic conditions in the vicinity of the intake structure and river diversion site during final design of this facility.

Significant impacts during operation, maintenance and abandonment of the intake structure and river diversion facility may occur due to an increase in flood elevations.

Mitigation measures at the proposed intake site (Farmington) could consist of raising the existing dike on the north bank of the low-water channel to prevent flooding of the adjacent agricultural lands. To help pass flood waters more efficiently, a smooth concrete facing could be poured on the river-side of the dike, which would also prevent it from being eroded or undermined.

Mitigation measures at the alternative intake site (Bloomfield) could consist of channel modifications or relocating residents whose homes are presently in the 100-year floodplain in the vicinity of the intake. Channel modifications could consist of constructing dikes along the south and north banks of the river and/or deepening and widening the low-water channel, both of which would provide increased flood carrying capacity. At the time increased flood elevations due to the alternative intake structure are assessed, the elevations at the Bloomfield sewage treatment plant should be measured and consideration should be given

to additional flood protection for the plant and its ancillary facilities (ponds, sewage outfall in river).

WATER QUALITY

Mitigation measures that should be implemented to prevent and manage potential spills associated with construction activities include:

- Only the recommended amounts of materials should be used and they should be applied in the recommended manner.
- Good housekeeping procedures such as proper disposal of empty containers, prompt cleanup of accidental spills, neutralization and deactivation of excess chemicals and wash water should be followed.
- Oil and oily wastes such as crankcase oil, cans, rags, and paper dropped in oils and lubricants should be disposed of in proper receptacles.
- Construction vehicles should be properly maintained to control petroleum leaks.
- Movement of contaminated sediments should be controlled by appropriate sediment control measures such as surface roughening, interception and diversion, vegetative stabilization and non-vegetative stabilization (mulches, netting, chemical binders, and sediment traps and basins).

Mitigation measures that should be implemented to manage the disposal of hydrostatic test water associated with pipeline testing should include the following activities (New Mexico Environmental Improvement Division):

- Whenever possible, hydrostatic test water should be disposed of on land, via evaporation pits or basins, with no surface-water discharge.
- Water should be discharged horizontally into discharge diffuser pipe to minimize flow velocity and prevent potential scour effects.
- If grease and oil are present, water should be routed through one or more straw bale filters, in sequence, to reduce concentrations to acceptable levels.

Because of the potential effects on downstream alluvial aquifers, wastewater discharges, if any, from the plant should be controlled and monitored. The monitoring plan for the effluent discharge should include the following activities (New Mexico Environmental Improvement Division and U.S. Environmental Protection Agency):

- All effluent discharge pipes should be equipped with continuous flow monitoring devices.
- All effluent discharge pipes should be equipped with devices able to continuously monitor for, at least, pH and specific conductance.
- All continuous monitoring devices on the discharge pipes should be connected to the central computer facilities for display, storage, and processing.
- Automated samplers should be used to collect grab samples for composite analysis of effluent discharges.
- Composite samples should be analyzed for the pollutants listed in the NSPS (including total suspended solids, oil and grease, total copper, and total iron). Other chemical parameters that should be measured in the composite samples include TDS, the common ions (calcium, magnesium, sodium, potassium, chloride, sulfate, carbonate, and bicarbonate), phosphorus and nitrogen species, as well as the 129 priority pollutants.
- If discharge occurs, water from downstream alluvial wells should be analyzed for the same parameters that were listed in the preceding paragraph.

- A discharge plan describing the quantity and quality of surface-water discharges and of the existing downstream surface-water and hydrogeological environment will be submitted to the NMEID for review and approval before the power plant becomes operational. NMEID approval of the discharge plan would ensure that downgradient ground-water contamination would be minimal.

An operations and procedures manual needs to be prepared to ensure that the evaporation and coal-pile runoff ponds perform as designed. Detailed information regarding all components of the liner systems should be available to the operating personnel. Special monitoring procedures should be developed to assess whether the liner system is operating within the design criteria. Specifically, the quality of collected leachate, if any, and the condition of the liner should be regularly determined and recorded. Embankments and berms should be examined for potential ground movements, cracks, and soil erosion. Plans to control vegetation and rodents should be included in the operations and procedures manual. In addition to these concerns, the unacceptable nature of certain operational practices should be identified. These unacceptable practices include:

- The discharge of high-temperature liquids onto exposed or unprotected liners (liners with no soil cover or with insufficient standing liquid levels)
- The passage of any vehicle over any portion of an exposed liner
- The discharge of incompatible wastes to the liner
- The direct discharge of wastes with high hydraulic energy upon a liner without adequate provision for energy dissipation
- Unauthorized modifications or repairs to the facilities

In addition to monitoring of the actual physical facilities, a monitoring network for downgradient ground waters should be established. This network would include new wells and existing wells. The monitoring system should also include a leak-detection system beneath the evaporation pond so that remedial actions, if necessary, can be taken in a timely manner before downgradient ground water becomes contaminated. Finally, NMEID approval of the discharge plan for the evaporation and coal-pile runoff ponds should ensure that downgradient contamination would be minimal.

VEGETATION

Areas temporarily cleared of vegetation should be graded to minimize percent slope, and also have soil restored. Contour furrows, traps, and other structures to minimize wind and water erosion, and maximize water collection and infiltration, should be employed (surface management agency or landowner).

After proper seedbed preparation, temporarily disturbed areas where plant root crowns have not remained intact should be replanted. Seed mixtures should contain shrubs, forbs, and native grasses. Seed mixtures should be specialized for a particular precipitation zone, yet be diverse enough to establish cover on the variety of soil types encountered. Both cool- and warm-season grasses should be included.

Revegetated areas should be monitored yearly to assess revegetation success, and replanted if seeds germinate but fail to establish. Seeds may remain viable in the soil for several years if rainfall is not sufficient for germination the first year.

Use buses or vans to transport workers from population centers to and from the job. Reducing the presence of private vehicles will reduce ORV use and consequent destruction of vegetation and erosion.

Baseline and ongoing monitoring studies of soil and water chemistry of high elevation landscapes sensitive to acidification (northeast of project area and in the Jemez Mountains of north-central New Mexico) should be conducted to measure possible acid rain impacts (U.S. Fish and Wildlife Service, U.S. Environmental Protection Agency, and

New Mexico Environmental Improvement Division).

WILDLIFE AND AQUATIC BIOLOGY

Avoidance of construction in crucial mule deer winter range during the period of December 1 through March 31 is recommended at the proposed (MP 0-2.75) or alternative (MP 0-1.0) intake structure and pipelines (New Mexico Department of Game and Fish, U.S. Fish and Wildlife Service, and BLM).

Avoidance of construction through crucial winter range of elk and mule deer on T4 (MP 65-75 and MP 93-95) between December 1 and March 31.

Avoidance of construction through areas with nesting raptors for the general period of February 1 through June 30. Modification to this period could be made by the BLM Area Manager with site-specific information from raptor specialists. Areas to be avoided should be specified by milepost by the BLM area manager.

Construction of a wildlife water source outside the fence that would surround the proposed reservoir. This would provide water to wildlife that would have been denied the use of an area that historically had supplied seasonal water. Because it would be a permanent water source, the wildlife water would also be an enhancement to general wildlife populations (BLM).

Construction of both pipelines simultaneously within the 90-foot right-of-way would eliminate disturbing habitat twice (surface management agency or landowner).

The employee information program (p. 1-30) could be expanded to include information on protected wildlife species and illegal shooting. Additionally, the program could provide information to employees about sensitive wildlife species and prevention of unnecessary human disturbance. Public affairs personnel could provide information on hunting and fishing opportunities and advise employees to use less-crowded areas (p. 1-30). Evaporation ponds and liquid waste discharge pits should be monitored for bird and small mammal mortality. If losses occur, remedial measures such as screens or fences should be constructed to prevent continued losses.

If fishes do not establish in the reservoir, introduce a suitable forage species that could serve as a food source for various water birds that may be attracted to the reservoir. Because no permanent water presently exists, this step would be an enhancement feature.

Increase stocking in the San Juan River to ensure continued quality fishing.

Use buses or vans to transport workers from the population centers to and from the job to reduce road kills related to increased traffic volume. Use of private vehicles would allow much easier opportunity for increased recreational vehicle use in relatively undisturbed areas. Such activity would likely increase habitat degradation, harassment of wildlife, and poaching opportunity.

THREATENED AND ENDANGERED SPECIES

Field surveys (100 percent coverage) should be undertaken to identify populations of listed or proposed plant species that may be affected. If these are located in the project area, it is recommended that construction should avoid the specific locations by rerouting, or spanning of transmission lines (surface management agency and U.S. Fish and Wildlife Service).

CULTURAL RESOURCES

In the areas requiring intensive inventory, significant known surface and subsurface resources should be avoided, recorded, or be investigated to recover an adequate sample of their included information prior to construction. The plan would also include some provision for the recovery of previously unknown and significant cultural information discovered during project construction and maintenance, where prudent and feasible, but this would not protect all possible resources in the proposed project area (New Mexico State Historic Preservation Officer and BLM). Specific approaches and further discussion of cultural resources mitigation is detailed in the Cultural Resources Technical Report.

VISUAL RESOURCES

Significant visual consequences have been identified for the NMGS and transmission lines. Various mitigating actions could be taken to reduce or eliminate certain consequences. It is recommended that general mitigating actions should include architectural or design changes to physical structures, resiting components, and landscaping techniques.

NEW MEXICO GENERATING STATION

The primary features of the proposed NMGS that would result in significant visual consequences are the vertical emphasis of plant components (stacks, storage tanks, etc.); the dominant scale and geometric (hard-edge) configuration of the structure, against the predominantly natural and horizontal background landscape; and night lighting. Although the plant would be visible from numerous vistas within a 12-mile radius, the contrasts viewed from the De-na-zin WSA would be the most significant. (Natural topographic relief would mask all but the top third of the stacks visible from the Bisti WSA.) Two techniques could be used to reduce the extent of contrast in form and line (surface management agency or landowner).

An initial mitigation should be to paint the stacks (or specify concrete coloring), storage tanks, boiler and generator housing, and other massive or vertical structures two or more colors, in a banded manner, to blend with the horizontal layering of colors in the natural setting.

The second technique for reducing contrasts would be the design of earthen berms along the site boundary between De-na-zin and the plant. Excess soil and rock removed during the construction phase of the project could be mounded in berms 10-20 feet high that would serve to mask the bottom portion of the plant and thus reduce the extent of visual contrast.

Illumination consequences would be most sensitive during the early fall and late spring months, when visitation to the WSAs is highest. Mitigation measures would include use of FAA-approved strobe lights with ground side shades for stack lights. Facility lights at ground level could be masked from view along the northeastern sides of WSAs by use of landscaped berms between the plant site and sensitive receptors or use of shading to deflect light toward the plant.

Use of the shortest possible stack heights, while still meeting air quality requirements, would also help reduce impacts.

TRANSMISSION LINES

Mitigation measures for reducing the extent of visual contrast of conductors and towers include using nonreflecting conductors where significant visual contrasts have been identified.

RECREATION

Recreation impacts would be both site-specific and activity-related. Mitigation measures for site-specific impacts focus on physical modifications to the project components. Mitigation for activity-related impacts focuses on augmenting the recreation resource base and improving visitor information sources and supervision of activities. Initial concepts for mitigation of recreation impacts are outlined below.

SITE-SPECIFIC IMPACTS

New Mexico Generating Station

Impacts affecting the Wilderness Study Area recreation experience would include noise and visual intrusions from plant operations and structures at both Bisti and De-na-zin WSAs (BLM).

Visual buffers in the form of earthen berms could be constructed along the northeast edge of the plant site viewed from De-na-zin (only the top third of the stacks will be visible from Bisti). Earthen berms could be constructed from topsoil moved during plant excavation, and should resemble natural formations and contours to blend with existing landscapes (BLM). Large boulders should be incorporated into the design. (Refer to the Visual Resources Technical Report for specific details and artist's concept.)

Night lighting of the plant should incorporate shaded sides to prevent direct glare noticeable from WSAs.

Transmission System

The primary transmission line impacts would be visual and are addressed under mitigation for visual impacts.

ACTIVITY-RELATED IMPACTS

Sightseeing and Visiting Historic Places

Impacts would include increased visitation to Wilderness Study Areas and Chaco Culture National Historical Park, as well as some of the other resources for this activity in the study region (BLM or National Park Service). Since increased visitation can result in crowded conditions, increased litter, vandalism, and stress on existing facilities, such as sanitation and drinking water, possible mitigation measure would include the following:

- Regulating the number of visitors at any given time period through gate control
- Increasing park supervision
- Expanding facilities and parking areas

The formerly proposed Bisti multiple resource center is an example of one such measure. All of these measures would fall under the purview of the National Park Service or BLM. Since public agencies currently face severe budget cuts and staff reduction, it is unlikely that these measures could be implemented without a method for subsidizing existing budgets. Supplemental funding from PNM could be provided in the form of a lump sum donation toward this mitigation action.

The applicant should provide on-site picnic areas at the plant site for use by employees and visitors. An effort should be made to make these areas aesthetic as well as practical. Landscaping, noise buffers, drinking water, trash facilities, picnic tables, and sun shelters should be provided at each picnic area.

WILDERNESS VALUES

Mitigation suggestions for wilderness consequences include the following:

- Avoidance of WSA boundary crossings by any project components (BLM).
- If designated as Wilderness Areas, increased supervision and maintenance of the Bisti and De-na-zin WSAs by BLM and addition of sanitary facilities and waste receptacles at entry points (minimum tools).
- Alternative trails within De-na-zin could be assessed and designed to direct visitors away from areas where vistas of the plant would be most prominent (BLM).

TRANSPORTATION

Require regular maintenance (e.g., blading, repair of culverts and drainage) by PNM for segments 20 and 21 of NM 371, and C-14 and C-15 during the construction phase of project.

SOCIAL AND ECONOMIC CONDITIONS

EMPLOYMENT

A requirement could be added to require an Indian hiring-preference clause for construction of NMGS-related ROWs and other construction. This would enable Indians living in the area to share in the economic benefits of NMGS (Bureau of Reclamation in conjunction with approval of water assignment for Navajo Reservoir).

HOUSING AND SOCIAL SERVICES

Specific standards should be developed to ensure that applicant-committed mitigation measures (Chapter 1) will be planned and implemented in a timely manner at an adequate level as needed (BLM).

UNAVOIDABLE ADVERSE IMPACTS AND IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES

Significant and major environmental impacts that would be unavoidable in the event of implementation of the Proposed Action or any alternatives are presented in Table 3-10. Unavoidable impacts are those impacts expected to occur even after application of the planning and

Table 3-10. UNAVOIDABLE ADVERSE IMPACTS AND IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES

Resource	Unavoidable Adverse Impacts	Commitment of Resources	
		Irreversible	Irretrievable
New Mexico Generating Station			
Air Quality	Air quality degraded by emission of the following pollutants (tons/day): TSP, 8; SO_2, 89; NO_x, 118; CO, 16.	No	No
	From Chaco Culture National Historical Park, perceptible plume discoloration is predicted to occur approximately 36-37 mornings and 5-6 afternoons per year, with maximum occurrence during winter. Highly perceptible plume discoloration is predicted to occur about 1-2 mornings per year.	No	No
Minerals	A total of 300 million tons of coal mined in the San Juan Basin and consumed.	Yes	Yes
Paleontology	Adverse impacts to some paleontological resources which could be damaged or destroyed.	Yes	Yes
Soils	Accelerated erosion due to wind and water resulting in decreased soil stability, and decreased soil fertility and productivity.	No	Yes
Wildlife	Increased hunting and fishing pressure would result in an average of 15,500 additional fish harvested per year through the year 2000 and 45 additional mule deer harvested per year through the year 2000. This represents an increase of approximately 2 percent over baseline harvest figures.	No	No

Table 3-10. UNAVOIDABLE ADVERSE IMPACTS AND IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES (continued)

Resource	Unavoidable Adverse Impacts	Commitment of Resources	
		Irreversible	Irretrievable
Cultural	Adverse impacts to some cultural resources which could be permanently lost and unavailable for future investigation.	Yes	Yes
Visual	The NMGS facility would exceed contrast ratings established for BLM class requirements.	No	No
Recreation	Increased use of the recreation base would result in significant increases in overcrowding, litter, fire, and uncontrolled ORV use. For those impacts which cannot be adequately supervised, adverse and unavoidable impacts would result.	No	No
Wilderness	The scenic character viewed from the Bisti and De-na-zin WSAs would be impaired, thereby adversely affecting the wilderness experience. Increased visitor use would result in impacts similar to those discussed for recreation resources.	No	No
Transportation	Significant delays and safety problems would result for those transportation routes that cannot accommodate projected traffic and for which no improvements are planned or implemented.	No	No
Social and Economic Conditions	Significant impacts could occur if projected housing demand exceeds availability.	No	No
	Significant impacts could occur to the quality and/or quantity of services available through human service agencies.	No	No

Table 3-10. UNAVOIDABLE ADVERSE IMPACTS AND IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES (continued)

Resource	Unavoidable Adverse Impacts	Commitment of Resources	
		Irreversible	Irretrievable
	Significant impacts could occur to traditional Navajo values and lifestyles. Some opportunities to pursue a traditional lifestyle could be lost.	Yes	Yes
Water Supply System			
Paleontology	Adverse impacts to some paleontological resources in highly sensitive zones for water pipelines P1, P2, and P3.	Yes	Yes
Soils	Accelerated erosion due to wind and water resulting in decreased soil stability, and decreased soil fertility and productivity.	No	Yes
Hydrology	Surface Water Consumptive use of 20,000 or 35,000 ac-ft/yr of San Juan River water for NMGS.	No	Yes
	Reduction of 28 or 48 cfs in the average San Juan River streamflow below the proposed or alternative intake sites, depending on the alternative.	No	No
	Increased flood elevations and associated flood damages in the vicinity of the intake structure on the San Juan River.	No	No
	Ground Water Consumptive use of 15,000 ac-ft/yr of ground water; significant drawdowns in three aquifers; unknown reduction in flow from springs in the Chuska Mountains; decrease in natural ground-water discharge to local streams.	Yes	Yes

Table 3-10. UNAVOIDABLE ADVERSE IMPACTS AND IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES (concluded)

Resource	Unavoidable Adverse Impacts	Commitment of Resources	
		Irreversible	Irretrievable
Hydrology (continued)	Measurable land subsidence near the well field.	Yes	Yes
Wildlife	Water pipelines P1, P2, and P3 would disturb mule deer crucial winter range.	No	No
Cultural	Adverse impacts to some cultural resources on P1, P2, and P3 which could be permanently lost and unavailable for future investigation.	Yes	Yes
Transmission System			
Paleontology	Adverse impacts to some paleontological resources in highly sensitive zones for transmission lines T1, T4, and T5.	Yes	Yes
Soils	Accelerated erosion due to wind and water resulting in decreased soil stability, and decreased soil fertility and productivity.	No	Yes
Wildlife	Transmission line T4 would disturb mule deer and elk crucial winter range.	No	No
Cultural	Adverse impacts to some cultural resources on T1, T2, T3, T4, and T5 which could be lost and unavailable for future investigation.	Yes	Yes
Visual	Portions of transmission lines T1, T2, T3, and T4 would exceed contrast ratings established for BLM class requirements. T2 and T3 would affect visitor experiences at CCNHP.	No	No
Wilderness	The scenic character viewed from the Cabezon WSA would be impaired by transmission line T2, thereby adversely affecting the wilderness experience.	No	No

environmental controls incorporated in the Project Description (Chapter 1) and the suggested mitigation measures and monitoring programs described in this chapter. Also included are the resources that would be irreversibly or irretrievably committed. Determination of irreversible or irretrievable commitment of resources assumes the same environmental controls and mitigation used in the analyses for unavoidable impacts.

RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The relationship of the Proposed Action and alternatives to the goals of NEPA is expressed in terms of a NEPA objective to maintain and enhance the long-term productivity of the environment. The evaluation of the short-term use of the environment, through implementation of the Proposed Action, was made with respect to current longer-term environmental trends within the affected environment.

Several short-term uses could create an environmental tradeoff situation with respect to long-term productivity. The main tradeoff involves the well-field water supply alternative. The well-field water supply alternative could affect ground-water levels in three aquifers for more than 100 years. This would affect the future beneficial use of these aquifers in the San Juan Basin. At the same time, generation of electric power would provide for a wide range of beneficial uses and increased productivity. The economies in the area of the project would be enhanced, and a high standard of living for a wide range of electric users would be promoted by transmitting electric power to baseload centers.

Other project-related impacts would foreclose fewer future alternative resource allocation options. Coal and other raw materials would be utilized as described. The value of the wilderness experience and opportunities for solitude in the project area would be reduced. Some cultural and paleontological resources would be recovered for scientific investigation, while others would be permanently lost and unavailable for future investigation. Project-associated population influx to the greater Farmington area would hasten the area's trend away from an independent, rural-oriented lifestyle to a more urbanized center of trade with its attendant congestion and human interdependencies.

OTHER POSSIBLE END USES OF THE UTE MOUNTAIN LAND EXCHANGE

Chapter I

Chapter I

DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

PURPOSE OF AND NEED FOR THE PROPOSED ACTION

The purpose of the Proposed Action is to exchange ownership and management of public lands located north and south of the Chaco Culture National Historical Park in San Juan and McKinley Counties for private lands located north of Questa, New Mexico, in Taos County. The BLM would acquire Ute Mountain, as well as lands east of the Rio Grande Wild and Scenic River. This could result in acquiring a potential Wilderness Study Area (WSA), wildlife habitat for game and nongame species, and lands that would provide additional recreational opportunities. Paragon could acquire land to enlarge its land and water holdings near Bisti, New Mexico, in San Juan County and in McKinley County.

HISTORY AND BACKGROUND

Negotiations on this proposed land exchange have been in process since 1974. The history and background of this proposal is on file and available for public inspection at the BLM Albuquerque District Office.

The Final Ute Mountain Exchange Environmental Assessment (September 1981) ("Final EA") (see Appendix J) discusses the resource values that would either be acquired or lost by BLM through the proposed land exchange. The Final EA did not consider the potential environmental impacts of uses that Paragon could make of the Bisti lands. The major planned use is as a site for the New Mexico Generating Station as described in the NMGS portion of this EIS. A new town was considered at one time but is not currently planned. No other potential end use is currently proposed by Paragon, but other uses are possible, including use of the lands as a wellfield. This part of the EIS describes the environmental effects of the new town and other uses and, along with the Final EA and the NMGS portion of this EIS, provides full NEPA coverage for the exchange proposal. Chapters 1-4 of the Final EA are reprinted in Appendix J.

DESCRIPTION OF THE PROPOSED ACTION

Paragon is proposing to exchange approximately 17,138 acres of private land for public land near Bisti, New Mexico. The amount of public land considered for exchange originally was approximately 29,952 acres. Of this amount, approximately 2237 acres in T24N, R11W (S1/2 of Section 34 and all of Section 35) and T23N, R11W (Sections 2 and 3) have been dropped from the exchange. Therefore, the total amount of public land being considered for exchange is 27,715 acres. Of the 27,715-acre amount, between 8000 and 9600 acres of public land could be exchanged for private land. Based on preliminary appraisal of the current market value of the public lands, the 8000- to 9600-acre figure is the approximate amount of land that would be equal in value to the 17,138 acres of private land. Map 1-1 in the EA shows the location of the public and private lands being considered for exchange. The legal description for both tracts of land is in Appendices A-1 and A-2 to the Final EA (Appendix J).

For ease in discussing the public lands proposed for exchange by Paragon, they will be referred to as "the Bisti lands". Map 1-2 in the EA shows the land status of the Bisti lands. Similarly, the private lands proposed for exchange by Paragon will be referred to as "the Ute Mountain Lands." Mineral rights

would not be exchanged, and the exchange could be done whether or not BLM intends to approve rights-of-way necessary for NMGS.

ALTERNATIVES TO THE PROPOSED ACTION

Alternative methods for acquiring both the Bisti lands and Ute Mountain are available to Paragon Resources, Inc., and the BLM, respectively. These are discussed below.

ALTERNATIVES TO ACQUIRING THE UTE MOUNTAIN LANDS

Alternative means for BLM to acquire the Ute Mountain lands from Paragon Resources, Inc., include purchase under Section 205 of Federal Land Policy and Management Act (FLPMA), or donation.

ALTERNATIVES TO EXCHANGING THE BISTI LANDS

Options for the BLM's authorizing action of use of the Bisti lands as a power plant site include right-of-way grant under Title V of FLPMA and sale under section 203 of FLPMA.

NO-ACTION ALTERNATIVE

The BLM would reject the exchange and would not acquire Ute Mountain or make the Bisti lands available to Paragon through means of a land exchange.

PARTIAL EXCHANGE ALTERNATIVE

The BLM could limit the exchange to part of the area originally proposed.

AUTHORIZING ACTIONS

Passage of FLPMA established new policy for land exchanges. The final regulations (Exchange Procedures for Public Lands) implementing FLPMA were issued on January 6, 1981. Under these regulations, the action required to authorize a transfer of ownership of public lands is approval of the proposed action by the District Manager. An application may be rejected if the Secretary of the Interior determines that ". . . the public interest will (not) be well served by making that exchange." Additionally, ". . . when considering public interest the Secretary concerned shall give full consideration to better Federal land management and the needs of State and local people, including needs for lands for the economy, community expansion, recreation areas, food, fiber, minerals, and fish and wildlife and the Secretary concerned finds that the values and the objectives which Federal lands or interests to be conveyed may serve if retained in Federal ownership are not more than the values of the non-Federal lands or interests and the public objectives they could serve if acquired" (Section 206(a) of the Federal Land Policy and Management Act of 1976) (FLPMA). Approval by the District Manager or, if required, the Secretary of the Interior would result in the issuance of a patent. Paragon would be required to convey to BLM's authorized officer the warranty deed or other documents of conveyance which meet the Department of Justice title standards (43 CFR 2201.5(b)) on private lands.

DESCRIPTION OF POSSIBLE END USES OF EXCHANGED LANDS

As previously stated, the identified end uses of the proposed exchange include NMGS, a wellfield and a possible new town. The impacts of the proposed NMGS have been addressed in the previous section. The new town and the wellfield are addressed here as possible end uses of the Ute Mountain Land Exchange; other possible end uses are discussed very briefly, because the uses are too remote and speculative for meaningful analysis.

NEW TOWN

General Project Description

Since the feasibility of the project is not established, a detailed description of a possible new town is not available. If ROW applications in support of a new town are submitted, a detailed project description would be required in order to assess site-specific and cumulative effects in accordance with National Environmental Policy Act (NEPA) and Council on

Environmental Quality (CEQ) regulations. In the description below, a general outline and range of projections for a new town development are presented in order to provide a general discussion of impacts.

The possible new town is located in T24N, R11W; south half of Sections 21 and 22; Sections 27 and 28; and the north half of Sections 33 and 34 (see Map 1-1 in NMGS Chapter 1 and the Appendix G maps). The new town would occupy approximately 2400 acres, with a controlled and undeveloped area surrounding the site. Access to the new town would be from existing roads.

Projected Size of a New Town

Paragon's feasibility studies examined a new town that would have the potential for serving between 8000 and 20,000 inhabitants (peaks due to temporary construction workers could exceed 20,000), with a more likely long-term population in the range of approximately 10,000 to 12,000. The ultimate size of the new town and the time frame in which it may be developed would be highly dependent upon the development of various energy projects in the area, including coal mines, coal gasification and liquefaction, power plants, and other oil and gas development. If a new town becomes feasible, initial development could begin in the mid-1980s.

Purpose and Need

The purpose of the possible new town was to accommodate a labor force and families in closer proximity to planned and possible future industrial development than the greater Farmington area.

The need for the possible new town has not been established at this time.

New Town Management

A subsidiary of PNM, such as Paragon, would provide management services to a new town, either on contract or directly. These services would be those normally provided by city management under the direction of a city council. In the event that the new town eventually became incorporated under the provisions of New Mexico statutes, such city services and city management activities would be transferred to the control of the city government.

Utilities and Other Services

Electric Service. Electric power would be provided to the new town inhabitants through a municipal distribution system. Power would be supplied in bulk through a 115-kilovolt (kV) tap from PNM's proposed Fruitland 230-kV transmission line. The tap would originate at a new substation (proposed as part of the Fruitland 230-kV project), to be located about 1 mile south of the proposed NMGS site. A 50-foot ROW would be needed from the proposed substation to the boundary of the new town site. No specific ROW has been designated. Although other alternatives may exist, one alternative that would be considered is a route paralleling County Road 15, which would connect the new town site to the NMGS site, a distance of approximately 12 miles.

Water and Sewer. Water and sewer services would be provided by a municipal utility system organized and managed by the new town sponsor. Water would be purchased on a bulk supply contract from a PNM subsidiary, such as Paragon, at the new town site. The subsidiary would assume responsibility for treatment and distribution of water to new town inhabitants.

Ground water from deep aquifers beneath the site area would be a potential water source. The annual projected use during a peak year (20,000 residents) is estimated at 4550 acre-feet per year (ac-ft/yr) (200 gallons per person per day). Paragon currently has pending with the New Mexico State Engineer an application to acquire ground water from the Westwater Canyon Member of the Morrison Formation in the San Juan Basin. Assuming approval of the application, a portion of this water could be used to supply new town residents. The Morrison Formation is approximately 5000 feet below the land surface at the new town site. The source of water for the town is assumed to be a well tapping a deep aquifer, such as the Westwater Canyon Member of the Morrison Formation. The water system would be financed by hookup charges, service charges based on consumption, and on direct

subsidies as may be appropriate to the development of the new town.

Sewage treatment and disposal for the new town would consist of an extended aeration package plant involving four primary treatment steps: (1) screening, (2) aeration, (3) settling, with sludge returned to the aeration section, and (4) effluent chlorination. The sewage treatment plant would be located on the new town site. Sludge solids would be landfilled or applied to public parks or greenbelt areas as fertilizer and soil conditioner. As with the water system, appropriate user fees and subsidies would be used to finance construction and operation.

Solid Waste Disposal. Solid wastes would be collected and used as landfill. A landfill would be established on the new town site and operated according to applicable county and state ordinances. The Institute of Solid Wastes estimates the required landfill space for an average community is 1.25 ac-ft/yr per 1000 residents. Using this average figure, the estimated landfill requirements for the new town at peak (long-term) population (20,000 residents) would be 25 ac-ft/yr.

Fire, Police, and Schools. Fire and police protection would be provided through a cooperative agreement with the county. Such services are normally provided by the county to an unincorporated community. However, dependent upon agreements reached with the county to ensure adequate fire and police protection, the new town sponsor may elect to supplement county services or to directly provide such services or to provide such services as fire and police protection. Financing for fire and police protection, whether provided through subsidy or through agreement with the county, must be arranged as the new town becomes established and grows. Schools would be provided for new town residents in cooperation with the county and local school districts. This could include financing the construction of schools, with eventual transfer of the schools to county jurisdiction, or it may include creating a new school district. Such schools would be constructed and provided for in accordance with state law.

Other Services and Commercial Enterprises. Medical services would be provided to initial new town residents through subsidies by the new town sponsor. Then, as the new town community grows in size and demand for a permanent medical clinic increases, Paragon would provide the capital investment requirements and attract interested physicians. The clinic, once fully operational, would operate as a private enterprise.

Other services would be provided as needed. Commercial enterprises, such as grocery and drug stores, clothing stores, service stations, and a possible bottled-gas supplier (because of the lack of available natural gas in the area) would be developed through agreements with private individuals and/or companies by the new town sponsor (using incentives, if required).

WATER WELLFIELD AND GATHERING SYSTEM

General Project Description

Paragon Resources, Inc., stated a water wellfield might be one possible end use of the Bisti lands. For purposes of impact assessment, a proposed water wellfield and gathering system was assumed for sixteen water wells approximately 35 to 45 miles south of Farmington, New Mexico. A portion of this water wellfield and gathering system are located on the Bisti lands. The effects of 15,000 ac-ft/yr of water use from these wells has been analyzed as an alternative water source for the proposed New Mexico Generating Station and related facilities (FEIS pp. 3-28 to 3-30). The potential impacts related to surface disturbances associated with the wellfield, including well pads, access roads, and pipeline gathering system, are the subject of this analysis.

Purpose and Need

If the use of more than 20,000 acre-feet per year of San Juan River water cannot be acquired, the applicant may need to develop a wellfield in the vicinity of NMGS to supply an additional 15,000 ac-ft/yr for the proposed wet-cooling system. This requirement is based on the proposed heat rejection system using wet-cooling towers and projected water use in the proposed plant as

described in the Project Description TR (pp. 2-36 through 2-40).

Scope of Analysis

The analysis of potential impacts to ground water and water quality that could result from the development of a wellfield is presented in the DEIS and in the supporting TRs for Hydrology and Water Quality. Issues discussed and analyzed in these documents include: administration of water resources, ground water quality, hydrogeology, modeling of potentially affected ground water sources, and potential impacts caused by pumping from the ground water source (Westwater Canyon Member Aquifer System). The wells required for development of the wellfield would be widely spaced, so collecting pipeline systems and new access roads would be necessary. In the following sections, potential impacts are analyzed that could result from surface disturbance related to construction and operation of the wells, pipeline system, and access roads.

Description of the Wellfield

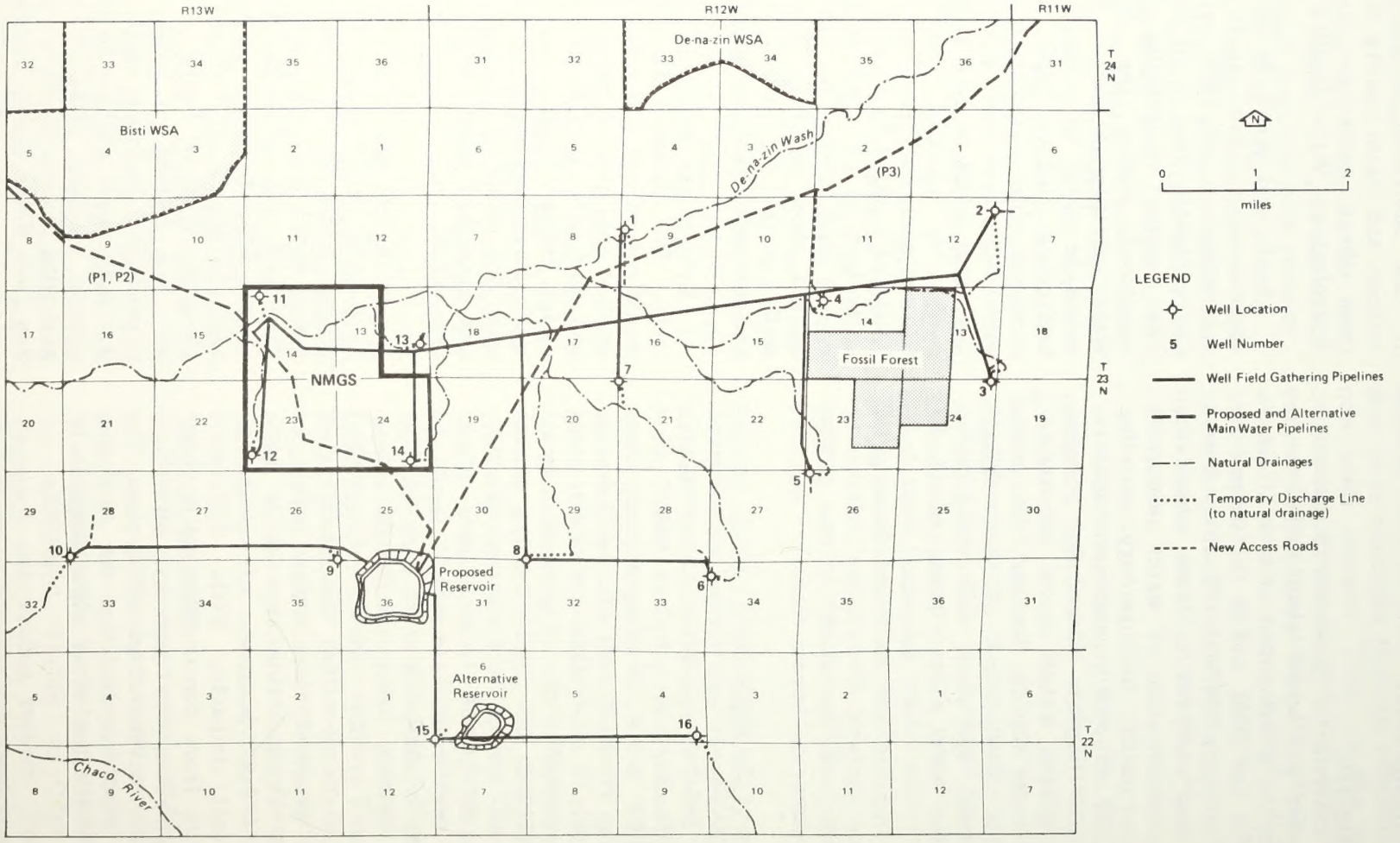
The proposed well sites are located within an area of approximately 14 square miles surrounding the proposed NMGS site, 35-45 miles south of Farmington, New Mexico (Map 1). Each well site would occupy approximately 5 acres (330 x 660 ft); total acreage occupied by the 16 well sites would be approximately 80 acres. Existing access roads would be utilized where possible. Approximately 18,500 feet of new access roads (20 feet or less in width) would be constructed, totaling 8.5 acres (Map 1). The gathering system (Map 1) would be a combination gravity flow and pumped system. Details of either the gravity flow system or pressure flow system would be determined at the time the wells were developed. For purposes of evaluating environmental impacts, little difference would result from constructing with either type of pipeline; the principal difference would be the method of installing pipe. The length of ROW required for the gathering system is 27.4 miles. ROW width would be 50 feet.

The proposed wells would be drilled to depths between 4000 and 6000 feet to extract water from the Westwater Canyon Member of the Morrison Formation. The rate, volume, and water quality of water extracted from these wells are discussed in the Hydrology and Water Quality TRs.

Each well would be tested by pumping approximately 150 ac-ft of water at approximately 100-1000 gallons per minute intermittently over a 10 to 20 day period. The aquifer replenishing rate would be monitored during the discharge period. Water discharged during the test period would be piped to natural arroyos through temporary surface pipe which would be removed after completion of the test. A submersible type pump powered by a portable generator would be used to test the wells and would be removed after testing. After testing, each well would be capped at ground level and covered by a 2x2x2-ft metal box or equivalent cover. The wells would remain capped until needed for NMGS. If the tests do not show adequate water supplies, the wells would be abandoned according to recommended BLM procedures.

Rotary rigs would be used to drill the wells. The disturbed area of each well pad would not exceed 330 x 375 feet. During the drilling operation, a rotary drill rig, reserve and mud pits, a trash pit, a utility trailer, casing trailer, logging unit, and a chemical toilet would be located on the well pad. Each well site would be cleaned up, recontoured, and smoothed when drilling operations are completed.

Each of the wells would require a deep-well, multi-stage turbine pump to deliver water to the ground surface. Each pump would discharge into a pipeline and then into the gathering system described above. Electric power would be conveyed to central points at 12.9 kV and then distributed along the pipeline routes to each well at 6.9 kV. The amount of power required would depend upon sustained water yields and later decisions about whether to deliver water to a central pumping plant or to a pressurized gathering system for direct injection into the San Juan River supply system pipelines. The pumps for either type of service would be controlled from a panel at NMGS and would



Map 1. WATER WELLFIELD AND GATHERING SYSTEM

shut down automatically in case of power outages or malfunctions of the pumping units and/or their control systems.

If water were delivered by gravity to a central pumping station, a two-unit pumping plant would be required. One pump would be the service pump and the other a standby. The pumping units would be alternated to equalize wear. Each pump would be rated at 17.6 cfs (8000 gpm) at a total developed head of 350 feet. A synchronous motor rated at 900 horsepower would be connected to each pump. The motor and pumping system would operate automatically, but the automatic controls could be overidden by controls at NMGS.

A 3-4 person crew would be required for construction of the well pads and access roads. Each drilling operation would require a 6-8 man crew. Equipment required for each construction and drilling operation would include one D-8 or D-9 Caterpillar, one road grader (maintainer), pickup trucks, diesel powered tractor-trailer pipe and casing trucks, water hauling trucks, and a mobile rotary drilling rig. (Each well test would require a submersible type pump, a portable generator, and a temporary above surface pipe that would be removed following the test period.)

Existing access to the wellfield is via State Highway 371, commonly known as the Bisti Highway, and via the County Road C-15 which connects Highway 371 with State Highway 44. Access to the well sites would cross primarily BLM and Navajo Tribal Lands; however, some state lands would also be crossed.

Pipeline and Access Road Construction Methods

Pipelines. The trench required for the pipeline gathering system would be 24 to 60 inches wide and 48 to 72 inches or more deep and would be centered on a line about 20 feet away from one edge of the ROW, providing about 30 feet of working space on the opposite side of the trench where stockpile material would be excavated. Preparation of the ROWs, trenching, pipeline stringing and welding, lowering, joining, grouting, crossing of drainages, backfilling, reclamation, monitoring and all other construction or monitoring methods proposed for the collecting system would be similar to those described on pp. 3-21 through 3-38 of the Project Description TR. The applicant would also undertake a number of construction and restoration practices that are detailed on pp. 3-34 through 3-38 of the Project Description TR.

Access Road. Existing roads would be used wherever possible for access to the well pads. Approximately 18,500 feet of new access roads (20 feet or less in width) would be constructed. A minimum of grading and backfilling would be used to allow equipment access during construction and subsequent periodic access during operation. Measures necessary to control erosion are the same as those described on pp. 1-28 and 1-29.

Applicant-Committed Practices. In addition to the construction and restoration practices detailed in the Project Description TR, the applicant would undertake the same design, construction, and restoration practices described in Chapter 1. The resource considerations are intended to reduce environmental impacts and are assumed for the purpose of analysis of potential wellfield impacts. As discussed for other project components, the applicant would be required to incorporate these practices into the Plan of Operation to be submitted to BLM for approval prior to issuance of a Notice to Proceed to construct.

OTHER INDUSTRIAL USES

Other possible uses of the Bisti lands were considered as alternatives but were not carried forward for more detailed analysis.

In their exchange application to the BLM, Paragon identified the NMGS, New Town and wellfield as possible end uses of the Bisti exchange lands. The balance of the lands would remain as grazing land. However, several other possible end uses have been suggested by a variety of sources but have not been the subject of communication between BLM and Paragon. Some of these include other possible industrial uses such as breweries, aluminum plants or motel complexes. Since these other

potential uses are remote and speculative, they could not be meaningfully addressed in this EIS. If any industrial uses became formal proposals, additional federal actions such as ROWs would most likely be necessary before a proposal could proceed, and additional NEPA compliance would be required for those actions. Despite this continuing approval authority, an exchange would tend to make the land area slightly more available for these kinds of industrial developments if they were to become economically or practically feasible in the future.

INTERRELATIONSHIPS WITH OTHER ACTIONS IN THE REGION

In addition to the proposed actions analyzed in this EIS, several other pending actions could affect the BLM's decisions on various San Juan Basin proposals.

NAVAJO LAND SELECTION (NAVAJO-HOPI RELOCATION)

The first of these actions is a selection that the Navajo Tribe has made of 35,000 acres of public lands (refer to Appendix H for a list of these lands). The selection seeks both the surface and mineral estates under Section 11 of the Navajo Hopi Relocation Amendments Act of 1980 (P.L. 96-305), which allows the Navajo Tribe to select up to 250,000 acres of public land within 18 miles of the current reservation boundary. It is not clear whether mineral estates will be transferred with the selection. Up to 35,000 acres of this land can be in New Mexico. The purpose of the selection is to provide a residence area for Navajos relocated from lands in Arizona as part of this settlement of a land dispute between the Hopi and Navajo Indian Tribes. The selection itself is exempt from the environmental requirements of the National Environmental Policy Act of 1969. This selection is currently under active consideration, but the Department has not yet reached a decision. Public Service Company of New Mexico, the Department of Interior, and the Navajo Tribe have been meeting to discuss how to resolve conflicts between the selection and NMGS proposals.

NAVAJO LITIGATION

The Navajo Tribe recently filed a lawsuit in the District Court for New Mexico, Navajo Tribe of Indians v. State of New Mexico, Civ. No. 83-1148-JB, in which the Tribe claims title to 2.1 million acres of land in northwest New Mexico. The suit claims virtually all the public lands and minerals within the proposed exchange area. If the suit is successful, the lands and interests covered by the suit would be made a part of the reservation, and title to the lands and minerals would be held in trust by the United States on behalf of the Navajo Tribe. In that case, the current proposals (Preference Right Lease Issuance and competitive coal tracts) would have to be dropped entirely.

The United States, the State of New Mexico, and others have filed motions to dismiss the lawsuit on a number of grounds. The existence of the litigation and its possible effect on the proposed actions will be considered in the decision making process for these proposals.

SUMMARY OF ENVIRONMENTAL IMPACTS

Tables I-1 and I-2 summarize the resource values and impacts to those resource values that would occur if this exchange were to be completed. The summary for the NMGS portion of this EIS contains the summary of the end-use impacts related to NMGS. The summaries for the other possible end-uses are in Table I-3.

Table I-1. SUMMARY OF RESOURCE VALUES

Bisti Lands	Ute Mountain Lands[a]
Paleontological Resources	Paleontological Resources
There are 5 Class I (Critical), 44 Class II (Highly Important), 155 Class III (Important), 296 Class IV (Not Important) fossil sites.	
Minerals	Minerals
Strippable and underground coal present.	The USGS indicates that the Ute Mountain lands are "without value" for locatable or leaseable minerals.
Coal leases in the Bisti WSA will be exchanged for a portion of 2640 acres of coal (identified in PL 96-475). The leases in the Bisti WSA are held by Sunbelt Mining Co.	
Paragon holds 879 mining claims on the Bisti North lands.	
Phillips Uranium holds 140 mining claims on the Bisti South lands.	
48 oil and gas leases.	
Deposits of sand, gravel, and humates are present.	Deposits of sand and gravel are present.
Mineral (subsurface rights would remain in federal ownership and management. The public would be allowed to continue to explore, stake claims and apply for leases, and to develop claims and leases for federal minerals under private land.	Mineral (subsurface) rights would remain in private ownership by Paragon, Mr. A. K. McMillan, and Rio Costilla Cooperative Livestock Association, who would be allowed to explore and develop minerals.
Access for the public to explore and develop future federal mining claims and oil and gas leases on private land is guaranteed by the BLM.	Access to explore and develop minerals is guaranteed to Paragon and Mr. A. K. McMillan.

Table I-1. SUMMARY OF RESOURCE VALUES (continued)

Bisti Lands	Ute Mountain Lands[a]
Minerals (cont'd)	Minerals (cont'd)
	A scenic easement agreement between Paragon and BLM restricts actions by the company on a quarter-mile stretch of land along the Rio Grande Wild and Scenic River. Mr. A. K. McMillan has access to land along the river.
Water Resources	Water Resources
Approximately 1500 acres of floodplains have been identified.	
Six USGS observation wells and three stockwater wells exist (2 stockwater wells owned by BLM and 1 by Paragon).	
Poor quality surface water and fair-to-poor quality ground water, at low yields, is present.	
Social and Economic Factors	Social and Economic Factors
The Bisti lands are used by the Navajo in collecting herbs and sandstone.	
Ten apparent Navajo burial sites, one sacred and gathering site, and an unknown number of religious sites are located on the Bisti Lands.	
	Increase in county revenue from in-lieu tax payments by the federal government.
Livestock Grazing	Livestock Grazing
Nine Indian operators graze livestock.	On the Ute Mountain Lands, 8160 acres (62%) of vegetation is in poor condition; 3537 acres (27%) and 1362 (11%) are in fair and good condition, respectively.
Phillips Uranium holds a grazing lease on the Bisti South lands.	
Portions of two grazing allotments, totaling 17,635 acres, are held by Paragon.	

Table I-1. SUMMARY OF RESOURCE VALUES (continued)

Bisti Lands	Ute Mountain Lands[a]
Livestock Grazing (cont'd)	Livestock Grazing (cont'd)
Range condition is not known for the vegetation on the Bisti lands.	
Cultural Resources	Cultural Resources
Inventories have been conducted on 11,352 acres. Lithic and Archaic sites comprise 57% of the known sites. Anasazi sites represent 7% of the known sites. Navajo sites could total 36% of the known sites.	Seven sities identified (2 undiagnostic lithic scatters, 1 late prehistoric/ early historic habitation site, 4 historic sites).
Wilderness	Wilderness
Three wilderness study areas (WSAs) are located adjacent to the Bisti lands. The three WSAs (Bisti, De-na-zin, and Ah-shi-sle-pah) are of an ecotype sparsely represented in the National Wilderness Preservation System.	Preliminary determinations indicate that the Ute Mountain lands may qualify for a WSA designation. The WSA would be of an ecotype that is well represented in the National Wilderness Preservation System.
Recreation	Recreation
A recreational ACEC has been designated in the BLM's planning update for the Chaco MFP. This ACEC includes the boundaries of the Bisti and De-na-zin WSAs.	
Recreation activities such as sightseeing, ORV, hiking, and rock collecting occur.	Backpacking, hiking, ORV, sightseeing, rock collecting, and cross-country skiing are recreational activities that could occur on the Ute Mountain lands under federal ownership.
Wildlife	Wildlife
The bald eagle (endangered), peregrine falcon (endangered), and black-footed ferret (endangered) are federal- and and state-listed species that may occur.	The same federal-listed species as for the Bisti lands may occur on the Ute Mountain lands. In addition, the state-listed species include the three federal species and the western toad (Group II), marten (Group III), and mink (Group II).

Table I-1. SUMMARY OF RESOURCE VALUES (continued)

Bisti Lands	Ute Mountain Lands[a]
Wildlife (cont'd)	Wildlife (cont'd)
The Bisti lands are not within an officially designated New Mexico Department of Game and Fish herd unit.	Less than 1% of the Ute Mountain lands are in each of 3 herd units (Sangre de Cristo Deer Herd Unit, Maxwell Elk Herd Unit, or Tres Piedras Antelope Herd Unit).
Habitat is of the plains grassland biome.	Habitat is comprised of portions of four diverse biomes: petran subalpine conifer forest and woodland; Great Basin conifer woodland; plains grassland; and Great Basin desert shrub.
Species diversity is composed of approximately 34 species of mammals, 72 species of birds, 12 species of reptiles, and 6 species of amphibians.	Species diversity is composed of approximately 60 species of mammals, 172 species of birds, 16 species of reptiles, 7 species of amphibians, and 13 species of fish.
Land Uses	Land Uses
ROW permits have been granted for transmission lines, roads, a railroad, meteorological sites, and observation wells.	
Visual Resources	Visual Resources
Class A scenic values have been identified for the Bisti lands located east and west of the Bisti WSA and south-southwest of the De-na-zin WSA.	

[a] Environmental components not discussed under Ute Mountain lands do not occur on them.

[b] Socioeconomic information is listed throughout the table, as it relates to the other resources.

Table I-2. SUMMARY OF RESOURCE IMPACTS

Resource Impacts		Management Options	
Bisti Lands	Ute Mountain Lands	Bisti Lands	Ute Mountain Lands
Paleontological Resources			
Portions of 5 sections with Class I paleontological sites could be lost from public access and federal management.			
Minerals		Minerals	
Through BLM planning, 4800 acres of underground coal and 2560 acres of potential surface mining areas could be considered for competitive coal leasing. Private surface ownership could influence bidding in a competitive lease or development of the lease by the lessee.		A decision on exchanging lands in the exchange that may be leased through competitive leasing could be delayed until a competitive lease(s) is issued.	
A portion of the lands listed for selection in PL 96-475 for the Coal Lease Exchange would be acquired by the Sunbelt Mining Company. Lands remaining from the exchange could be eligible for competitive leasing under other federal laws and regulations.		A decision on exchanging the Bisti lands (approximately 2640 acres) could be delayed until the Coal Lease Exchange is completed or until a competitive lease is issued.	

Table I-2. SUMMARY OF RESOURCE IMPACTS (continued)

Resource Impacts		Management Options	
Bisti Lands	Ute Mountain Lands	Bisti Lands	Ute Mountain Lands
Minerals (cont'd)		Minerals (cont'd)	
Surface disturbance could occur on private land in the development of Preference Right Leases. Section 209 of FLPMA[a] does not provide for reimbursement to the surface owner for damages due to mineral entry.			
Surface disturbance could occur on private land in the development of 48 oil and gas leases and 140 mining claims. Section 209 of FLPMA does not provide for reimbursement to the surface owner for damages due to mineral entry.			
If Phillips Uranium patents the surface estate of any of the 140 mining claims, Paragon could lose up to 2009 acres of the surface estate of these lands if acquired in the proposed exchange.			

Table I-2. SUMMARY OF RESOURCE IMPACTS (continued)

Resource Impacts		Management Options	
Bisti Lands	Ute Mountain Lands	Bisti Lands	Ute Mountain Lands
Minerals (cont'd)		Minerals (cont'd)	
Surface disturbance to private lands would occur during future exploration and development of federal minerals. Section 209 of FLPMA does not provide for reimburesement to the surface owner for damages due to mineral entry.	Surface disturbance to federal lands would occur during exploration and development of private minerals.		
	Surface disturbances by Mr. A. K. McMillan could occur from mineral exploration and development on land next to the Rio Grande Wild and Scenic River.		Obtain from Mr. A. K. McMillan a scenic easement along the Rio Grande Wild and Scenic River.
Water Resources		Water Resources	
PLM could lose management of up to 1500 acres of floodplains.			
Access to wells by USGS, Indian livestock operators, and Phillips Uranium could be lost.		If USGS and livestock operators apply for an ROW permit to these wells prior to an exchange, place a clause in the patent to reserve access to these wells.	

Table 1-2. SUMMARY OF RESOURCE IMPACTS (continued)

Resource Impacts		Management Options	
Bisti Lands	Ute Mountain Lands	Bisti Lands	Ute Mountain Lands
Water Resources (cont'd)		Water Resources (cont'd)	
		Develop new water sources for livestock operators (Indian operator and Phillips Uranium) if land with livestock wells on it is selected.	
Social and Economic Factors		Social and Economic Factors	
	Increase county revenue from $1025 to approximately $10,794 with in-lieu tax payments by the federal government.		
Public access and federal management of herbs and sandstone located on lands selected in the exchange could be lost.			
Public access and federal management of burial and religious sites located on lands selected in the exchange could be lost.			

Table I-2. SUMMARY OF RESOURCE IMPACTS (continued)

Resource Impacts		Management Options	
Bisti Lands	Ute Mountain Lands	Bisti Lands	Ute Mountain Lands
Livestock and Grazing		Livestock and Grazing	
The total known livestock grazing resource of a maximum of 9 Indian livestock operations could be eliminated. Up to 667 animal unit months (AUMs) could be eliminated. Up to $1504 could be lost to the government in annual revenue from grazing permits. All of the public lands (264 AUMs) within the Phillips Uranium grazing lease could be eliminated. Up to $609 could be lost to the government in annual revenue from this grazing permit. A portion of 1924 AUMs could be eliminated from federal management and go into private management by Paragon. A portion of $4444 could be lost to the government in annual revenue for grazing permits.	Approximately 982 AUMs (Soil Conservation Service) may be available for livestock grazing. Range condition may limit livestock grazing.	Select other Bisti lands prior to selecting lands with Indian allotments.	

Table I-2. SUMMARY OF RESOURCE IMPACTS (continued)

Resource Impacts		Management Options	
Bisti Lands	Ute Mountain Lands	Bisti Lands	Ute Mountain Lands
Cultural Resources		Cultural Resources	
Public access and federal management of 8000 to 9600 acres of the Bisti Lands containing cultural resources could be lost.	Public access and federal management of 17,138 acres of the Ute Mountain lands containing cultural resources could be acquired.		
Wilderness		Wilderness	
A loss of federal management could occur for any selected Bisti Lands that are adjacent to the WSAs.			
Recreation		Recreation	
A loss of federal management could occur for any selected lands that are adjacent to the Bisti/De-na-zin ACEC.			
Recreational opportunities occurring on the Bisti Lands would occur on other lands in the San Juan Basin.	Recreational opportunities such as sightseeing, ORV, hiking, backpacking, and cross-country skiing could be available to the public.		

Table I-2. SUMMARY OF RESOURCE IMPACTS (concluded)

Resource Impacts		Management Options	
Bisti Lands	Ute Mountain Lands	Bisti Lands	Ute Mountain Lands
Wildlife		**Wildlife**	
Habitat for threatened or endangered species may occur.		May exclude Bisti land acreage having threatened or endangered species habitat from the exchange.	
A loss of federal management being utilized by a small herd of antelope.	Acquire federal management of land with less than 1% of each of 3 herd units.	Construction of water developments, fencing, and supply of adequate forage on those lands adjacent to the Bisti lands selected in the exchange.	
The habitat on the exchange lands, for a maximum of 21 species of wildlife, may not be managed by BLM.	The habitat on the exchange lands for approximately 159 species of wildlife could be added to federal management.		
Land Uses		**Land Uses**	
Future ROWs and expired permits would not be granted or extended by BLM.	Future ROWs may be granted by the BLM.		
Visual Resources		**Visual Resources**	
Public access to and federal management of 2193 acres of Class A scenic land could be lost.			

Table I-3. SUMMARY OF POTENTIAL IMPACTS FOR OTHER END USES OF THE UTE MOUNTAIN LAND EXCHANGE

AIR QUALITY	
Estimated annual emissions due to increased vehicular traffic generated by a new town	Tons per year
TSP	19
Sulfur dioxide	17
Nitrogen oxides	260
Hydrocarbons	151
Carbon monoxide	960
PALEONTOLOGY	
	Acres
Possible new town acreage in highly sensitive areas	2400
Wellfield project components in moderate to highly sensitive areas	220
SOILS	
	Acres
Moderate to high temporary increases in wind-induced soil erosion due to wellfield development	220
Moderate to high temporary and permanent increases in wind-induced soil erosion due to possible new town development	2400
HYDROLOGY	
Drawdown which would occur to ground-water users whose wells tap to West Water Canyon member, Dakota Sandstone, and Entrada Sandstone Aquifers in the San Juan Basin	Feet 25
VEGETATION	
Shrubland-grassland disturbed	Acres
Wellfield	25
New Town	1980
Juniper savanna disturbed	399
Sand wash and saline lowland disturbed	
Wellfield	165
New Town	211

Table I-3. SUMMARY OF POTENTIAL IMPACTS FOR OTHER END USES OF THE UTE MOUNTAIN LAND EXCHANGE (concluded)

WILDLIFE	
Small and medium-sized mammal habitat removed or disturbed	Acres
Wellfield	220
New Town	2400
Raptor nests within 5 miles of project components	Number
Wellfield	2
New Town	2
THREATENED OR ENDANGERED SPECIES	
Threatened or endangered plant species with potential habitat disturbed directly or indirectly	Number
New Town	1 (*Sclerocactus mesa verdae*)
VISUAL RESOURCES	
Acreage that would exceed contrast ratings for VRM Class IV areas	Acres
New Town	2400
RECREATION	
Important recreation areas that would most likely be impacted by physical presence of a new town and increased recreational use by new residents	Number 4
WILDERNESS VALUES	
	Number
WSAs potentially affected by physical presence of a possible new town and increased use by new residents	2
TRANSPORTATION	
	Miles
Approximate annual increase in local vehicular traffic	29×10^6

Chapter II

Chapter II

AFFECTED ENVIRONMENT

This chapter describes the resource components of the environment that could be affected by the potential development of a new town and/or a wellfield. These resources include climate and air quality; geologic setting (including geologic hazards); mineral resources; paleontological resources; soils and prime and unique farmlands; water resources; vegetation and range; wildlife; threatened and endangered species; cultural resources; visual resources; recreation resources; wilderness values; transportation networks; social and economic conditions; and land use controls and constraints.

For the purposes of this EIS, descriptions of resources are summarized and the level of detail provided is limited to that necessary for the general discussion of projected impacts in Chapter III. Chapter 2 of the Final EA provides a broader discussion of the environmental resources that may be affected by the proposed exchange. Chapter 2 includes discussion of paleontology, minerals, water resources, social and economic factors, livestock grazing, cultural resources, wilderness, recreation, wildlife, land uses, and visual resources.

NEW TOWN

AIR QUALITY

Because of a lack of industrial development in the region surrounding the proposed new town site, air quality is generally considered good. Air quality measurements of nitrogen dioxide, sulfur dioxide, and total suspended particulates, as well as meteorological conditions, wind speed, wind direction, precipitation, and solar insolation, made at the proposed NMGS site 12 miles to the southwest are considered representative for the new town site. Pollutant concentrations measured at the NMGS monitor were low, and were often measured at the threshold limit of detection for the recording instruments.

NOISE

Noise levels in the vicinity are represented by the levels measured in the De-na-zin WSA. These values are in the range of 32 to 35 dB(A), and are representative of secluded areas.

GEOLOGIC SETTING (Including Geologic Hazards)

The area in which a new town would be located lies on the upper part of the Naashoibito Member of the Kirtland Formation and the lower part of the Ojo Alamo Sandstone. The entire area is covered by a thin layer of surficial Quaternary alluvium (underlain to a large extent by bedrock). Topography is flat to gently rolling, with ridges and badlands on the northern half of the new town site. No potential geologic or seismic hazards are known in the area.

MINERAL RESOURCES

Potential oil or gas fields are the only commercial mineral resources that are expected to occur in the area of the new town site.

PALEONTOLOGICAL RESOURCES

The possible new town site would be located in the middle of a region that has been known for more than 120 years to contain rich deposits of highly important paleontological resources. Aspects of the paleontology of this region, e.g., in the Bisti

Badlands and Fossil Forest, are currently the subject of intensive research by professional paleontologists from across the United States. Extensive exposures of fossiliferous bedrock within a 15-mile radius of the new town site are among the richest in the entire San Juan Basin. This is especially true for Cretaceous and Paleocene continental deposits. Most research has centered on these exposures, and a large amount of literature now exists on the paleontology of this area.

The possible new town site lies on the upper part of the Naashoibito Member of the Kirtland Formation and the lower part of the Ojo Alamo Sandstone. There is virtually no bedrock exposure within the site boundaries, the entire area being covered by a thin layer of surficial Quaternary alluvium. Petrified wood, including large sections of logs and abundant small fragments, are found over much of the site. This material appears to have been derived as a lag deposit during the development of the present soil profile and alluvial cover. None of this material constitutes a significant paleontological resource, although it suggests the possibility that significant plant fossils might be encountered during bedrock disturbances in the possible new town site.

There are no previous reports of fossils from the possible new town site, but occurrences reported from adjacent areas (Kues et al. 1977; Rowe and Sundberg 1980) indicate a strong probability that significant vertebrate fossils occur in the immediately subsurface bedrock of this area. BLM, University of Arizona, University of California, and Museum of Northern Arizona locality archives record numerous localities in nearby stratigraphically equivalent areas. Numerous significant specimens have been recovered from these localities. The distribution of fossils in adjacent areas projects an estimate of 10 significant paleontological occurrences per square mile of bedrock at the possible new town site.

SOILS, PRIME AND UNIQUE FARMLANDS

Soils

The possible new town site is within the San Juan River Valley Mesas and Plateaus portion of the Western Range and Irrigated Region (SCS 1978a). Two different soil associations were identified at the site: Sheppard-Huerfano-Notal and Shiprock-Sheppard-Doak (SCS 1979).

The soils identified at the new town site are primarily deep. The dominant surface textures of the soils identified at the site are loamy fine sand, sandy clay loam, silty clay loam, fine sandy loam, and loam. These soils are well to somewhat excessively drained. The identified soils are forming in eolian, alluvial, and residual materials derived primarily from sandstone, shale, and silt stone. These soils are forming primarily on gently to strongly sloping mesas, plateaus, intermittent drainageways, terraces, and fans. Topsoil availability at the possible new town site is good, but the topsoil quality is primarily fair to poor. Susceptibility of these soils to wind-induced erosion is moderate to high, and susceptibility to water-induced soil erosion is low to moderate. The identified soils are mildly to strongly alkaline, and shrink-swell potential ranges from low to high. These soils currently support vegetation that is used primarily for livestock grazing and wildlife habitat.

Prime and Unique Farmlands

The soil types present at the new town site do not qualify as Prime Agricultural Land (SCS 1978b, 1980); nor does the site have any Unique or Statewide/Locally Important Farmland. Therefore, further analysis was not conducted.

HYDROLOGY

There are no known surface-water impoundments, wells, or springs at or in the immediate vicinity of the new town site (USGS 1981a; Link and Kelly 1980). Alluvium in the unnamed wash most likely contains minor amounts of shallow ground water. The depth to other water-bearing units at the site (e.g., sandstone beds in the Fruitland Formation or Pictured Cliffs Sandstone) is on the order of 100 feet or more. The expected yields of wells that tap these units probably would be sufficient for stock or domestic uses. The depth to the Westwater Canyon Member of the Morrison Formation, the most extensive regional aquifer in the San Juan Basin, is approximately 5500 feet.

WATER QUALITY

The new town site would be located in the drainage basin of De-na-zin Wash. The quality of water in these intermittent streams is likely to be similar to that found in De-na-zin tributaries near the proposed NMGS plant site. Levels of total dissolved solids (TDS) probably range from less than 500 milligrams per liter (mg/l) to over 2000 mg/l; suspended solids concentrations are expected to be high. Total metal concentrations are high, with most of the metals being associated with particulate matter. The quality of ground water found in sandstone beds in the Fruitland Formation or Pictured Cliffs Sandstone is also expected to be similar to that found near the proposed NMGS plant site. Chemical analyses of wells tapping the Westwater Canyon Member indicate that water from these wells could be characterized as sodium sulfate types, with varying concentrations of calcium, bicarbonate, and chloride. The water from this aquifer would generally not be suitable, without treatment, for municipal water supply or irrigation uses. A review of available standards and criteria suggests that these waters could be used for stock watering.

VEGETATION

Three regional vegetation types and four subtypes are present on the new town site. The three regional types (and subtypes within the broader regional types) are: (1) Shrublandgrassland regional type (subtype big sagebrush-blue grammagalleta grass, 1980 acres); (2) juniper savannas and pinyon-juniper woodland regional types (subtype juniper, 399 acres); and (3) sand wash and saline lowland regional type ([subtype sand wash, 34 acres] [subtype greasewood-galleta-alkali sacaton, 177 acres]).

WILDLIFE

There are no deer, elk, pronghorn antelope, or any other big game in the area where the new town site would be located. Typical small and medium-sized mammals that would be associated with vegetation present on the site include the black-tailed jackrabbit, white-tailed antelope squirrel, silky pocket mouse, plains pocket mouse, northern grasshopper mouse, and coyote.

Game birds are not abundant on the site, although both scaled quail and mourning dove occur. Two raptor nests (Swainson's hawk and long-eared owl) are reported within 5 miles of the new town site.

Because of a lack of permanent aquatic habitat on the site, waterfowl or aquatic species are either not present or occur infrequently and seasonally.

THREATENED AND ENDANGERED SPECIES

The following federally listed or proposed threatened or endangered species have range or potential habitat that occurs in the vicinity of the possible new town site.

- Black-footed ferret (Mustela nigripes), endangered
- Bald eagle (Haliaeetus leucocephalus), endangered
- Peregrine falcon (Falco peregrinus anatum), endangered
- Mesa Verde cactus (Sclerocactus mesae verdae), threatened

No prairie dog colonies are present on the new town site or within a 5-mile buffer zone. No suitable nesting habitat for bald eagles or peregrine falcons exists on the new town site or within a 5-mile buffer. Occurrence of either species would therefore be as occasional migrants.

No suitable habitat for the Mesa Verde cactus exists within the new town boundaries. However, the species has been reported immediately west of the proposed NMGS site, and heavy clay and gravelly soils in the De-na-zin WSA immediately north of the new town site are potential habitat.

CULTURAL RESOURCES

The San Juan Basin has been inhabited for at least the past 11,000 years and retains a complex record of that human occupation. Archaeologically, the area is best known for its record of the culture of the Chacoans, a prehistoric Anasazi people who lived in the

region from AD 500 to AD 1300. However, it also holds significant remains of earlier Paleo-Indian and Archaic cultures and later Navajo history. It is the traditional as well as present home of several Native American peoples, especially the Navajo, but also the Ute to the north, and Jicarilla Apache to the east, and the Puebloans to the south and southeast. Finally, it has a sparse but significant record of historic Euroamerican habitation of the area. Archaeological and ethnological studies of prehistoric and modern cultural resources have been conducted in this area for a century, providing an understanding of the significance of those resources. At the same time, the complexity of this cultural resource base is such that only a small portion of it is presently described in sufficient detail for making specific management decisions.

Archaeological site densities can be estimated from Class III archaeological survey data for the south-central San Juan Basin. Assuming the new town site would represent an average area in the San Juan Basin, the total number of sites expected would range from 32 (for a low average density) to 61 (for a high average density).

VISUAL RESOURCES

The landscapes in the general vicinity where a new town would be located are desert open space, with no distinctive landform features. Little color variation exists, and there is little change in texture or form. The surrounding landscapes are occupied by grassland and sagebrush vegetation. Aside from NM 371 and NM 44, only secondary unimproved roads lead to the general vicinity from Farmington. The visual quality rating for the landscapes surrounding the new town site is Class C; they have a Visual Resource Management (VRM) Class IV rating.

RECREATION RESOURCES

The public lands in the San Juan Basin are characterized by open expanses of semiarid country surrounded on the fringes by forested mountains. Because the general region is semiarid, surface water attracts many people for recreation activities. Mountains that surround the general region are also suited to many recreation activities. The general study region has not been an area of high recreation use, for several reasons. A relatively small area population, poor roads, general lack of surface water, few publicized recreation attractions, prohibitive land ownership patterns, lack of tourist services, and poor access to gasoline have discouraged utilization of the area's recreation potential.

WILDERNESS VALUES

The De-na-zin WSA is located within one-half mile of the northwestern corner of the site that would be considered for the possible new town. This WSA occupies 19,000 acres of badlands formations that possess outstanding scenic qualities as well as valued paleontological resources. The area exhibits rich colors, forms, and texture variation, ranging from light bleached sands to mounds having black and purple soil colors. The natural formations, the presence of petrified logs and fossils, and the expansiveness of the untouched area all combine to make the De-na-zin WSA highly valued for scenic, educational, and recreation purposes.

The De-na-zin WSA has a visual quality rating of Class A, high visual sensitivity, and is in a VRM Class II area.

TRANSPORTATION

The new town site would be located along San Juan County Road 15 (unimproved) approximately midway between NM 371 to the west and NM 44 to the east (see Map 2-5 in NMGS Chapter 2). Current traffic on these narrow graded dirt roads is estimated to be fewer than 20 vehicles a day. There are no ditches or culverts for roadway drainage, making the roads nearly impassable during inclement weather.

Safety is one of the primary deficiencies of highways and roads in the San Juan-McKinley County network. Other regional considerations are discussed in NMGS Chapter 2.

SOCIAL AND ECONOMIC CONDITIONS

The possible new town site is currently uninhabited and supports domestic livestock

grazing and wildlife. The nearest communities are Farmington, Aztec, Bloomfield, and other unincorporated communities in northern San Juan County and in Crownpoint and Thoreau in McKinley County. Regional social and economic conditions are described in NMGS Chapter 2.

LAND USE CONTROLS AND CONSTRAINTS

The possible new town site is in an area that is currently classified as public lands under the management of the BLM. As required by the Federal Land Policy and Management Act of 1976 (FLPMA), BLM has prepared comprehensive Management Framework Plans (MFP) for various planning units in the area. The MFP for the Chaco and San Juan Planning Units (updated 1981) covers the area of the possible new town site. A relevant major recommendation in this MFP is the following:

- Make BLM public lands available for the Ute Mountain Exchange. (In effect, this could transfer the surface ownership of the land for a new town from public to private [PNM] ownership.)

WATER WELLFIELD AND GATHERING SYSTEM

Ground-water supply and water quality for the wellfield are discussed in the EIS and supporting TRs.

Resource components associated with the proposed wellfield are located in the same general area (Map 1) and are similar to the resources discussed in the FEIS for the proposed plant site, related project components, and possible New Town. Therefore, only those aspects of resource environments that vary from Chapter 2 of the FEIS and supporting TRs are discussed below.

AIR QUALITY

Because of a lack of industrial development in the region surrounding the wellfield, air quality is generally good. Air quality measurements as well as meteorological conditions, wind speed, wind direction, precipitation, and solar insolation made at the proposed NMGS site are considered representative for the wellfield.

NOISE

Noise levels in the vicinity are represented by the levels measured in the De-na-zin WSA. These values are in the range of 32-35 dB(A) and are representative of secluded areas.

GEOLOGIC SETTING

Regional and site-specific geology for the wellfield is described in the DEIS and in the Geologic Setting TR. Topography is flat to gently rolling, with some ridges and badlands. No potential geologic or seismic hazards are known in the wellfield area. Unusual geologic formations occur in the Fossil Forest near the southeastern portion of the wellfield.

MINERAL RESOURCES

Coal reserves are present in the area of the proposed wellfield, as described and mapped in the FEIS and Mineral Resources TR. Generally these reserves consist of: 1) marginal deep and shallow coal beds located within the boundaries of the proposed NMGS, and 2) strippable coal of the Bisti Fruitland coal field northeast of the proposed NMGS and in the areas of proposed well numbers 2, 3, 4, 5, 7, and 9.

PALEONTOLOGICAL RESOURCES

The wellfield would be located in the middle of a region that contains rich deposits of important paleontological resources (FEIS). Extensive exposures of fossiliferous bedrock are located through-out the area that would be occupied by wellpads, access roads, and the gathering system. Paleontological sensitivity of the area proposed for the wellfield varies from moderate to high (Paleontology TR).

SOILS, PRIME AND UNIQUE FARMLANDS

The wellfield would be located within the San Juan River Valley Mesas and Plateaus portion of the Western Range and Irrigated Region described in the FEIS. Ten different soil associations are present along

the proposed system of wellfield pads, gathering pipelines, and access roads. The identified soils are deep to shallow, well to somewhat excessively drained, sandy clay loam, clay loam, loam, loamy fine sand, fine sand, fine sandy loan, very fine sandy loam, silty clay loam, and clay. Soils are forming in alluvial, eolian, and residual materials derived primarily from sandstone, shale, and siltstone on mesas, plateaus, hills, and intermittent drainageways. The terrain slopes range mainly from gently sloping to moderately sloping. Topsoil quality of the soils identified ranges from poor to good due to undesirable surface textures (too sandy or clayey), shallowness, or excess salt/sodium. The Muff soil type is difficult to reclaim if the topsoil is removed and not replaced. Susceptibility to wind-induced soil erosion ranges from low to high, but it is primarily moderate to high. Susceptibility to water-induced soil erosion is primarily low to moderate. These soils are mildly to strongly alkaline. Shrink-swell potential of the identified soil is low to high (notal soil has a high shrink-swell potential). These soils are currently used primarily for livestock grazing, wildlife habitat, and, to a lesser extent, energy resource development.

Soil types present within the proposed wellfield do not qualify as Prime Agricultural Land, nor does the wellfield have any Unique or Statewide/Locally Important Farmland.

WATER QUALITY

The wellfield would be located in the drainage basin of De-na-zin Wash. The quality of water in these intermittent streams is similar to that discussed for the proposed NMGS and possible New Town.

VEGETATION

Two regional vegetation types are present within acres proposed for well pads, gathering system and access roads. These types are the sand wash/saline lowland types (approximately 165 acres) and the shrubland-grassland types (approximately 25 acres). Descriptions of these regional vegetation types are provided in the Vegetation TR.

WILDLIFE

Wildlife resources within the proposed wellfield area are similar to that described for the proposed NMGS and possible New Town site. Small and medium-sized mammals are most abundant while big game and game birds are relatively uncommon. Waterfowl and aquatic species are rare because of a lack of preferred habitat.

THREATENED AND ENDANGERED SPECIES

The following federally-listed or proposed threatened and endangered species have range or potential habitat that occurs in the vicinity of the proposed wellfield:

- Black-footed ferret (endangered)
- Bald eagle (endangered)
- Peregrine falcon (endangered)
- Mesa Verde cactus (threatened)

A Biological Assessment has been prepared to address species that could be affected by the wellfield, NMGS, possible New Town, and other lands covered by the Ute Mountain Land Exchange EA. The BA is contained in Appendix H. In addition, the wellfield area was also included in an Endangered Species Survey of 30,000 acres of BLM land in the San Juan Basin (PNM 1981). Both of these reports are incorporated by reference to the wellfield analysis and are summarized below.

No suitable nesting, wintering, or other important habitat for bald eagles or peregrine falcons exist within the area proposed for the wellfield. Occurrence of either species would be as occasional migrants. No Mesa Verde cactus or black-footed ferret sign was identified in surveys of potential habitat present on lands proposed for the wellfield.

CULTURAL RESOURCES

Archeologically, the area within the San Juan Basin is best known for its record of the Chacoan culture, a prehistoric Anasazi people who lived in the region from 500 to 1300 A.D. The region also holds significant remains of earlier Paleo-Indian and Archaic

cultures and later Navajo history. Further discussion on regional cultural resources is contained in the DEIS and Cultural Resources TR.

The proposed well sites, access roads, and about half of the pipelines ROWs, have been inventoried (BLM Class III) (University of New Mexico 1981, PNM 1982). The balance of the pipelines ROWs would also be inventoried in accordance with FEIS p. 1-29 commitments. A summary of identified sites from Class III inventories includes two lithic sites, one Pueblo II habitation site, and two localities consisting of sparse cortical debris within naturally occurring clusters of residual gravels.

VISUAL RESOURCES

The landscapes in the vicinity of the wellfield are, in general, desert open space with muted colors, sandy clay soils and sparse vegetation. The area has a scenic quality rating of C because the landscape features are common to the physiographic region. Visual sensitivity is rated "low" because of poor road access and the isolated, barren nature of the landscape. The VRM rating is Class IV.

The southeastern portion of the wellfield would be located near the Fossil Forest where unusual geologic formations are present. Currently this area is designated VRM Class IV, although a portion has been recommended by BLM as an Area of Critical Environmental Concern (ACEC).

RECREATION

Historically the region surrounding the proposed wellfield has not been an area of high recreational use for several reasons: relatively small area population, poor roads, general lack of surface water, few publicized recreation attractions, prohibitive land ownership patterns, lack of tourist services, and poor access to gasoline. The Bisti and De-na-zin Wilderness Study Areas (WSAs), located 3-6 miles north of the wellfield (Map 1), provide unique recreational opportunity for hiking, primitive camping, horseback riding, photography, and sightseeing.

WILDERNESS VALUES

The De-na-zin and Bisti WSAs are located 3-6 miles north of the proposed wellfield. Descriptions of both are contained in the FEIS and Wilderness TR.

TRANSPORTATION

Roads in the immediate vicinity of the wellfield (e.g., San Juan County Road 15) are narrow graded dirt roads with no ditches or culverts for roadway drainage. Safety, traffic volume, and other regional considerations are discussed in the FEIS and Transportation TR.

SOCIAL AND ECONOMIC CONDITIONS

The proposed wellfield is uninhabited and supports domestic livestock grazing and wildlife. Regional social and economic conditions are described in the FEIS.

Chapter III

Chapter III

ENVIRONMENTAL CONSEQUENCES

This chapter discusses the environmental consequences that could result from approving the exchange, with particular focus on the development of a new town and wellfield and the environmental consequences of no-action and other alternatives. Impacts are addressed for each of the resource topics described in Chapter II. In the impact analysis, broad categories and general types of impacts that could be expected are discussed. Those categories of impacts with the most potential to result in significant impacts are emphasized. In general, quantification of anticipated impacts is not presented and would not be possible until a new town or wellfield is proposed and specific development plans are available. Chapter 3 of the Final EA discusses impacts of the exchange on resources. It is reprinted in Appendix J and summarized in Tables I-1 and I-2.

NO-ACTION

The effect of the no-action would be to continue the status quo for all lands, and both the Bisti and Ute Mountain lands would be subject to the existing and committed uses. This would mean that NMGS could not be located at its proposed site, and that Paragon would continue to hold grazing licenses on the Bisti lands but would not have any title interest in the lands. It would also mean that the Bisti lands would be available for transfer to the Navajo Tribe without regard to the conflict with the exchange pursuant to its selection under the Navajo-Hopi Relocation Amendments Act and that Paragon would obtain the right to use and develop the Ute Mountain lands even though that development could conflict with the Rio Grande Wild and Scenic River. The only protection to the river would be through the 1980 scenic easement described on page 1-2 of the Final EA. See also the discussion of the No-Action Alternative in the NMGS part of the EIS.

NEW TOWN

AIR QUALITY

Air quality impacts that would result from a new town would include pollutant emissions associated with vehicles and residential home heating. Assuming an initial population of 2000, with 2000 vehicles, the estimated annual increase in local vehicular traffic is estimated to be approximately 29 million vehicle-miles. Annual emissions due to increased vehicle travel were estimated from available EPA (1979) emission factors and are as follows (in tons per year): total suspended particulates, 19; sulfur dioxide, 17; nitrogen oxides, 260; hydrocarbons, 151; carbon monoxide, 960. These emissions would be spread over the length of the local roadways, and no significant impacts are expected.

If county roadways in the vicinity of a new town would be paved, it is expected that emissions of particulate matter due to traffic on paved roads would be small and would have an insignificant impact on air quality in the project region. If they are not paved, then suspended particulates would result from traffic use to a level dependent on roadbed engineering and maintenance.

Residential Emissions

Emissions and impacts on air quality would result from construction and activities associated with increased population in the area. The primary pollutant would be particulates, although some gaseous pollutants such as nitrogen oxides, sulfur dioxide, and carbon monoxide would be emitted from the numerous combustion

activities associated with home heating and internal combustion engines. Provided the new town would be a residential center with no additional industry, any impacts of gaseous pollutants associated with the new town would be minimal, since they would be relatively small and spread out over a large area.

NOISE

Noise impacts associated with the possible new town would result primarily from resident-related automobile traffic. Noise levels on a road such as C-15 are dependent on the number of vehicles in a given time period. It is not known to what degree this road would be used; assuming a rate of 100 vehicles per hour, noise levels at 50 feet from the road would be in the range of 60 to 65 dB(A). A rate of 500 vehicles per hour would be likely to produce noise levels of 65 to 70 dB(A) at 50 feet from the road. At 2000 feet from the road, noise levels would attenuate to ambient levels.

Automobile use within the new town itself would obviously contribute to noise levels along roads and near residences. It is not possible to provide an accurate estimation of vehicle use in the town or a precise approximation of noise levels. However, it is reasonable to assume that during the most active portion of a day, noise levels would be in the range of 50 to 65 dB(A) within the town, dependent on the location and the level of automobile or other noise-related activity at such location.

GEOLOGIC SETTING (INCLUDING GEOLOGIC HAZARDS)

No impacts to unique or scientifically important geologic formations would be expected. No potential geologic or seismic hazards would be expected.

MINERAL RESOURCES

Drilling of potential oil or gas fields would not be prevented or restricted by construction of a new town. Any potential wells would be expected to be widely spaced and would not conflict with a new town development.

PALEONTOLOGICAL RESOURCES

The proposed development of a new town would be expected to result in direct impacts to significant paleontological resources within the site boundaries. These would be primarily from bedrock disturbances during construction. Since the entire site is covered by alluvium, it is not possible to predict the exact locations of the fossils expected to exist in the underlying bedrock. However, based on comparative data, the new town site is classified as being of high paleontological sensitivity.

Because of development of a new town would be accompanied by a large influx of permanent residents to the area, the potential indirect adverse impacts of this possible population influx on the paleontological resource could be significant. In general, the scientific values of fossil beds close to population centers suffer badly from fossil collecting by amateurs or "rockhounds." Miller, Tidwell, and Petersen (1979) discuss this problem as it applies specifically to the exposures surrounding the study area and present photographs of fossils used in residential landscaping. The delicate nature of most fossils requires difficult and specialized collecting techniques that are rarely employed by nonprofessionals, generally causing severe damage to the fossils and their depositional environments. Nonprofessional fossil collection could be expected to occur along washes and drainage exposures in the area.

SOILS, PRIME AND UNIQUE FARMLANDS

Soils

Construction of the new town would disturb approximately 2400 acres of soils and topography. The entire new town site would probably be permanently changed from its preconstruction use (grazing and wildlife habitat) to an urban development. Expected types and causes of soils impacts and potential reclamation problems, such as water or wind erosion and removal of topsoil, would be similar to those discussed for NMGS.

Construction of utilities (e.g., water, gas, electric power) necessary for the new

town would disturb an unknown amount of soils and topography. An unknown amount of additional land in the vicinity of the new town could be adversely affected (e.g., accelerated erosion, compaction, and reduced productivity) by recreational pursuits (e.g., ORV use) of new town residents.

Prime and Unique Farmlands

Construction of the possible new town would not affect any Prime, Unique, or Statewide/Locally Important Farmland.

HYDROLOGY

If any facilities for the new town were built in the floodplain of the unnamed wash that crosses the site, impacts due to increased flooding might result. The new town development itself may increase downstream flows due to reduced infiltration because of the increase in impervious surfaces. It is assumed that a well tapping a deep aquifer, such as the Westwater Canyon Member of the Morrison Formation, would be drilled at the new town site to provide a supply of water for construction and municipal uses. Such use of ground water may cause drawdown of the water levels, which could affect other wells that also tap that aquifer.

WATER QUALITY

Construction and operation of the new town could affect both surface- and ground-water quality. Sediment loss during construction could increase the level of suspended solids and turbidity in downstream waters. Potential increases in those parameters would not be expected to be noticeable because of the already high existing levels of suspended solids and turbidity in these ephemeral streams when flow occurs. Spills of solvents, detergents, other construction-related fluids, and concrete would be expected to degrade surface soils but would not be expected to affect usable ground-water supplies.

Disposal of municipal solid waste produced by the new town could degrade ground-water quality. However, because of the absence of surface waters in the area, only ground-water aquifers in the immediate area of the landfill site could be affected. Urban runoff could contribute suspended solids, nutrients, trace metals, and pesticides to downstream areas. Disposal of treated municipal sewage could affect downstream surface- and ground-water quality, depending on the treatment or disposal option chosen. For example, surface-water discharge of treated effluent could (depending on the level of treatment) increase the levels of nutrients, pathogenic organisms, and refractory organics in downstream surface and ground waters. If an option such as evaporation/percolation ponds was chosen, ground water in the immediate area of the ponds and downgradient of the percolation ponds could be affected.

VEGETATION

Direct effects of construction would include removal of or damage to approximately 2400 acres of vegetation and increased erosion rates. Removal of or damage to existing vegetation would not be considered significant because the vegetation types removed or damaged are common throughout the San Juan Basin and therefore do not constitute a unique resource. Construction activities that would remove vegetation from large areas of soil would also result in increased water and wind erosion in affected areas. Erosion impacts of the possible new town should be compared against the relatively high background rate of natural soil movement in this area.

Indirect impacts would include physical damage to vegetation and soils from ORV use and foot traffic. Impacts would occur in areas with jeep trails and denuded slopes and banks. Typically, vegetation would be removed or greatly degraded in small, isolated areas by such use, rather than a general, extensive decline in condition. A second possible indirect impact would be the creation of small wetland areas along previously intermittent drainages made perennial by municipal water discharge. A third potential indirect impact would be the harvest of particular plant species for human

use, particularly firewood. Juniper is the only tree for many miles. Adult trees could be locally eliminated by firewood collectors.

WILDLIFE

Approximately 2400 acres of wildlife habitat would be permanently disturbed or removed if a new town were built. The majority of small mammals, birds, and reptiles would probably be either destroyed or displaced. Species that would be likely to recolonize (e.g., mice, coyote, jackrabbits, passerine birds) would be those tolerant of human activity and habitat disturbance. The resultant species composition would probably be lower in diversity and density.

The permanent presence of humans in the area would probably result in an increase in road kills, poaching, and general harassment. Animals would probably become more wary of humans and may move some distance away from the settlement.

Since there is no aquatic habitat present or close the possible new town site, there would be no impacts to any aquatic habitat.

THREATENED AND ENDANGERED SPECIES

If Mesa Verde cactus is present on the possible new town site, or in areas that may be affected because of increased recreational use of ORV activities, potential impacts could include:

- Direct destruction of populations or individuals
- Accelerated erosion in areas supporting the species
- Removal of local populations by cactus collectors

CULTURAL RESOURCES

A new town development would probably cause total surface disturbance in areas of residential structures, stores, parking lots, installation of utilities, schools, firehouses, community centers, water wells, access roads, and so forth. Also, if a large work force were stationed in a remote portion of the San Juan Basin, indirect impacts to archaeological sites, such as the Pierre site, a Chacoan outlier, would result from the marked increased population engaging in evening and weekend recreation activities. Indirect impacts could include damage caused by alteration of vegetation, leading to increased erosion, and increased pot hunting and collection of other surface materials as a recreational activity. Direct and indirect impacts cannot be quantified or their significance evaluated until more specific information about the size, boundaries, and proposed period of occupation of a new town facility is projected.

VISUAL RESOURCES

Two general types of visual consequence would result: (1) direct changes to the visual character of the natural setting from the introduction of physical structures (homes and service buildings), utility lines, streets, water and sewage systems, and other ancillary facilities; and (2) indirect changes to the surrounding landscapes from the activities of resident populations (such as litter, vandalism, visual scars from unauthorized use of ORVs, and reduced visibility as a result emissions from autos and wood-burning stoves).

The access provided by the two major roads (NM 371 and County Road 15 via NM 44) to the possible new town site, and the proximity to the Bisti and De-na-zin WSAs, could increase sensitivity in this remote area over future years. Since views are expansive from the elevated portions of the WSAs and roadways, the unnatural form, line, colors, and texture of a human development such as a new town would present a visual intrusion in the open and gently rolling natural landscapes that compose the background scenery viewed from these areas. Visual consequences would be particularly noticeable to WSA visitors, whose expectations include being surrounded by vast, open landscapes formed by the forces of nature, with the imprint of man's work substantially unnoticed, and opportunities for solitude or a primitive and unconfined type of recreation.

RECREATION RESOURCES

The increase in population in this sparsely populated region would generate new recreation needs and may place additional

demands on nearby recreation resources, including Chaco Culture National Historical Park. Because of the likely proximity to the Bisti and De-na-zin WSAs, the increased noise, visual intrusions, and visitation by the new population would significantly affect the experience of solitude in the natural, uninhabited surroundings of these resource areas. Increased population from a new town in the study area could affect resource sites in the Santa Fe National Forest and recreation areas on the Jicarilla Apache Reservation because they would be the closest recreation resources available and accessible via NM 44. An increase in ORV use in the general vicinity of the new town area is likely (particularly when used for hunting, rock hounding, or artifact and fossil collecting). Extensive ORV use could affect the wilderness experience at the De-na-zin WSA and Bisti Badlands, as well as degrade the aesthetic quality of the surrounding landscapes by introducing noise and unnatural lines (tracks) across the terrain.

WILDERNESS VALUES

If a new town were located in the general proximity of the Bisti and De-na-zin WSAs, significant consequences could result from both its physical presence and increased use of the wilderness resources by the new town's residents. The physical presence of a new town, if visible from bistas within the WSA, could impair the scenic quality and natural character of the background landscape. Increased visitation, traffic noise, and illumination would affect opportunities for solitude. Increased visitor use could result in litter, vandalism, and unauthorized use of ORVs in the WSAs, requiring additional supervision and maintenance from BLM.

TRANSPORTATION

Residential development along the unimproved county road would require upgrading of the road by San Juan County to accommodate regular vehicular traffic. At a minimum, the road would require drainage ditches, culverts, and surfacing for use during inclement weather. Potential positive consequences could result from the new town development once the access road is improved; specifically, commute traffic would be reduced during peak hours on NM 371 from Farmington to the NMGS plant site.

SOCIAL AND ECONOMIC CONDITIONS

If a new town were built in the 1980s, it would have an adverse effect on Farmington, Aztec, Bloomfield, and the unincorporated communities in northern San Juan County. The Farmington area seeks growth and is capable of managing and accommodating projected growth based on the analysis for NMGS. If a new town were constructed near NMGS, its residents would probably rely on the Farmington area as a primary source of retail goods, services, and entertainment. However, with the existence of the possible new town, Farmington and other communities would not benefit from increased population growth, or from a broader tax base.

Northern San Juan County would potentially benefit from construction of a possible new town only if the pace of energy development were to increase substantially beyond the levels projected for NMGS. If, for example, numerous simultaneous developments caused the regional population to "boom," northern San Juan County communities might not be able to accommodate all of the growth easily. The result would be "boomtown" conditions in the Farmington area--shortages of housing and necessary services, and a variety of other social and economic stresses.

Some NMGS workers might perceive the construction of a new town as a benefit because it could provide better or less expensive housing than would be available in the Farmington area, and because it would eliminate commuting (and its associated time, costs, and hazards). New housing stock in the new town would be in better condition than some of the existing housing in Farmington, and would probably be made attractive by developer subsidies, at least initially. Since the number and quality of services and amenities in the town cannot be estimated at this time, it is difficult to speculate on residential preferences. Many people, however, might still prefer residing in an older, established community with a full range of services.

In theory, Navajos would benefit from a new town because it would provide housing and other amenities better than those available in reservation communities, as well as easy access to jobs. In practice, however,

Navajos have preferred to stay in communities on or near the reservation. Only about 5 percent of Farmington's population, for example, is Navajo, compared with 35 percent countywide. Thus Navajos seeking employment are likely to prefer commuting from Shiprock or Crownpoint rather than trying to integrate into a modern Anglo community. Further, more traditionally oriented Navajos who use the "checker-board area" would certainly perceive the new town as an intrusion on their opportunities to continue traditional pursuits, including grazing and private ceremonies.

LAND USE CONTROLS AND CONSTRAINTS

The possible new town would not conflict with any existing formally adopted or formally proposed land use plans or policies in effect in the affected environment. The Navajo-Hopi land dispute settlements are discussed in the NMGS EIS section on land use controls and constraints and the NMGS EIS Land Use Controls and Constraints Technical Report.

SUGGESTED MITIGATION

Pending the receipt of ROW applications in support of a new town, a detailed project description and a detailed site-specific impact assessment would be used as the basis for developing relevant mitigation measures.

WATER WELLFIELD AND GATHERING SYSTEM

Several resource components and other environmental issues would not be impacted by the proposed wellfield and therefore are not discussed further in this analysis. These include: threatened and endangered species, prime and unique farmlands, ACECs, and floodplains or flood hazard zones.

AIR QUALITY

The principal source of air pollution would be fugitive dust emissions from earthwork and engine exhaust from equipment. Construction-related emissions would be over the entire wellfield area but would end upon completion of construction. These emissions would not be expected to significantly affect ambient air quality.

NOISE

Temporary increases in noise levels would occur in the wellfield area due to the operation of heavy equipment. Heavy equipment and construction activities typically produce noise levels of approximately 90 decibels at a distance of 50 feet from the source (EPA 1974). These levels would decrease to the level of normal conversation, approximately 60 decibels, within about one-quarter mile of the source, and would assume an attentuation rate of 6 decibels per doubling of distance. These impacts would cease upon completion of construction. No residences would be affected, and no significant impacts to the Bisti and De-na-zin WSAs are expected, as discussed in EIS Chapter 3.

GEOLOGIC SETTING

No well sites, pipelines, or access roads would be located on unique or scientifically important geologic formations. No potential geologic or seismic hazards have been identified in the wellfield area.

MINERAL RESOURCES

Well sites, pipelines, and access roads would be located to avoid significant coal reserves within known coal resource areas that occur in the wellfield. In order to further conserve other than significant coal reserves for both surface and underground mining and to provide maximum economic recovery of coal reserves on or off an existing preference right lease application (PRLA), the applicant would submit a detailed plan outlining the methods for establishment and abandonment procedures. If mining approaches subject wells, the applicant and BLM would establish an agreement regarding mining through the wells, in accordance with BLM's MFP for the area which establishes the precedence of coal recovery over other uses of this area.

PALEONTOLOGICAL RESOURCES

Direct impacts to paleontological resources due to destruction, damage, or alteration of bedrock formations would be limited by implementation of applicant-committed practices (EIS, p. 1-28). Indirect

impacts due to increased recreational fossil collecting or commercial collection of materials would be similar in description but less in magnitude, than indirect impacts discussed for the NMGS because the construction and operation work force required for the wellfield would be small.

SOILS

Leveling and blading of each well pad would disturb soils on approximately 45 acres of the total 80 acre well-site ROWs. Construction of the proposed access roads and collecting pipelines would disturb soils on approximately 175 acres.

On the well pads, an increase in erosion would occur until drilling operations were completed and disturbed areas were reseeded. An increase in soil erosion would also occur on newly constructed access roads and collection pipeline corridors until roadways became compacted and pipeline corridors were revegetated.

Reclamation problems similar to those discussed for the proposed main water pipeline (P1) would be encountered at well pads, access roads, and the wellfield gathering system. Chapter 1 of the EIS presents the applicant's proposed erosion control and reclamation procedures Applicable to the wellfield gathering system. Additional mitigation is suggested in Chapter 3 of the EIS. If a moderately intensive erosion control and reclamation program were implemented following construction, most of the disturbed areas should recover within three to five years. (The soils monitoring program discussed in Chapter 3 of the EIS also applies to the wellfield.)

WATER QUALITY

Sediment loss during construction could increase the level of suspended solids and turbidity in local ephemeral streams. Potential increases would probably not be noticeable because of already high existing levels of suspended solids and turbidity in ephemeral streams that could be affected. Discharge of any hydrostatic testing waters would have little or no effect on surface-water quality. Further discussion of water quality impacts expected for surface water within the wellfield is in Chapter 6 of the Water Quality TR.

VEGETATION

Direct effects of construction would include removal of 45 acres of vegetation on well pads and 175 acres of vegetation on access roads and pipeline collection system corridors. Removal or damage to existing vegetation would not be significant because the vegetation types removed or damaged are common throughout the San Juan Basin. Construction and restoration practices detailed on pp. 3-34 through 3-38 of the Project Description TR would further reduce impacts to vegetation.

WILDLIFE

Direct effects of construction would include removal of 220 acres of wildlife habitat. The majority of small mammals, birds, and reptiles utilizing this habitat would be destroyed or displaced. No important or sensitive big game, upland game, or waterfowl habitat would be affected. Several raptor nests occur in the general vicinity of the proposed wellfield, as discussed in the FEIS and Wildlife TR. Some of these nests could be temporarily affected (one breeding season) by construction-related disturbances in the wellfield. However, because of applicant-committed practices described in the FEIS, no nesting sites would be physically disturbed and any affected birds would be able to return to historical nesting sites once construction was completed.

CULTURAL RESOURCES

Direct impacts to cultural resources would be limited by implementation of applicant-committed practices discussed in Chapter 1 of the FEIS. These practices would include a 100-percent BLM Class III inventory in any areas of the pipeline collecting system not already surveyed, avoidance of significant cultural resources, and implementation of an approved mitigation plan for resources that cannot be reasonably avoided.

Indirect impacts to cultural resources would be similar in description, but substantially less in magnitude, than those

indirect impacts discussed for the NMGS because the construction and operation work force required for the wellfield would be small and would likely already live in the local area.

VISUAL RESOURCES

The common physiographic characteristics of landscapes that would be occupied by wellfield components and the low-profile characteristics of the introduced features would result in insignificant changes to the visual resources and scenic quality. The one potentially sensitive area is the Fossil Forest in Township 23N, Range 12W, Sections 13, 14, 23, and 24, where construction activities could detract from the naturalness and scenic experience of visitors to the area. This distraction would be limited to a short construction period.

RECREATION RESOURCES

The types of impacts that could result from the wellfield construction and operation work force would be similar to impacts described for the NMGS. However, the magnitude and duration of impacts would be less because of the small work force required and short duration of construction activities.

WILDERNESS VALUES

The low profile of introduced features from wellfield components and the small work force introduced in the area would not be expected to result in impacts to the Bisti and De-na-zin WSAs.

TRANSPORTATION

Increases in traffic that would result from the wellfield construction and operation work force would be minor and temporary. Adequacy of access to the wellfield for work force and supplies is discussed in the FEIS and Transportation TR.

SOCIAL AND ECONOMIC CONDITIONS

The construction of wellfield components would increase the assessed valuation of the taxing jurisdiction occupied by these facilities. Potential property tax revenues that could accrue would be based on the total cost of wellfield facilities and the tax rate of the jurisdiction affected. Examples of estimated tax revenues for NMGS water supply pipelines are given in Table 9-3 of the Social and Economic Conditions TR. Tax revenues generated by construction of the wellfield would be somewhat less than these estimates based on adjustments to taxable value. Given the small work force, no other impacts would be expected.

LAND USE CONTROLS AND CONSTRAINTS

The wellfield would not conflict with any existing formally adopted or formally proposed land use plans or policies. The Navajo-Hopi land dispute is discussed in the FEIS.

OTHER INDUSTRIAL USES

Transferring the Bisti lands through the exchange will make the land potentially available for industrial uses other than NMGS, the new town, and the wellfield. No specific analysis can be made of these other uses except to note that they are possible and become easier to achieve as a result of the exchange. Uses mentioned have included a brewery and an aluminum plant. These other uses are unlikely to receive any serious consideration in the next 10-15 years or longer. Most large-scale uses probably cannot be accomplished without further permits, leases, or ROWs from BLM. These uses would remain subject to BLM's control and further NEPA analysis. It is possible that some uses could be done without any further BLM approval. Therefore, one effect of this proposal is that it may facilitate a variety of industrial development use of an unspecified nature on the Bisti lands. The environmental effects would include those normally accompanying development of this type, such as increased water use, air and water pollution, change in the nature of the area, and destruction of paleontological and cultural resources. The corresponding benefits would be the usual ones of increased jobs and revenues. Any efforts to be more precise would be totally remote and speculative. The potential for these impacts is a factor in the decision-making process,

but more detailed information is not essential to a reasoned choice among the alternatives.

ALTERNATIVES TO ACQUIRING UTE MOUNTAIN

Instead of acquiring Ute Mountain by exchange, the BLM could acquire it through purchase or donation. Purchase would be under Section 205 of FLPMA and would require Congressional appropriation of funds. Donation would require no special legislation. Either alternative would require Paragon's agreement, as the Secretary's eminent domain power would not extend to this area in the absence of special legislation.

If this alternative were chosen, its environmental impacts would generally be similar to acquiring the Ute Mountain lands by exchange. This alternative could be done either as part of a decision to make the Bisti lands available to Paragon by sale or right-of-way or could be pursued singly.

ALTERNATIVES TO EXCHANGING THE BISTI LANDS

Options for the BLM's authorizing action of use of the Bisti lands as a power plant site include ROW grant, lease, and sale. The environmental consequences associated with construction and operation of NMGS would be the same as stated in FEIS Chapter 3. The differences between these alternatives would involve the amount of control BLM could exercise and the ownership of the land after NMGS was abandoned. For either a ROW grant or lease, BLM would have jurisdiction over the use of the land as stipulated in either the grant or lease, and the land would remain in public ownership. This would make available an additional enforcement mechanism that might increase the effectiveness of mitigating measures which PNM would have to meet. The expected environmental effects of retaining BLM ownership of the land after a power plant is abandoned versus company ownership are too remote and speculative for meaningful analysis now.

If the land were to be sold, it would become private land and would not be under the jurisdiction of BLM. The BLM would receive monetary benefit from the sale, but would not obtain Ute Mountain. In other respects, making the land available by sale would have the same effects as making it available by exchange. In particular, the approximately 30 other federal and state permits would still be required for approval of NMGS.

PARTIAL EXCHANGE

The BLM and Paragon could decide to limit the amount of lands to be exchanged. One possible partial exchange is for BLM to give to Paragon by exchange only the approximately 2500 acres needed for the NMGS site. This partial exchange would result in the BLM retaining control of other public lands in the Bisti area. This would effectively eliminate other potential uses of the Bisti lands for new towns or other actions Paragon may envision. The countervailing effect is that BLM would receive approximately 3000 to 6000 acres less land in the Ute Mountain area, thereby reducing to some extent the benefits of the exchange. Another partial exchange that is possible would be to exclude the NMGS plant site from the exchange. This would have the effect of eliminating the environmental impacts of that project unless other authorizing actions would be taken. Similar effects as discussed above would occur on the Ute Mountain lands.

UNAVOIDABLE ADVERSE IMPACTS AND IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES

Environmental impacts that would be unavoidable in the event of implementation of the Proposed Action or any alternatives are presented in Table III-1. Unavoidable impacts are those impacts expected to occur even after application of planning and environmental controls that could be required by permit stipulation. Also included are the resources that would be irreversibly or irretrievably committed. Determination of irreversible or irretrievable commitment of resources assumes the same environmental controls and mitigation used in the analyses for unavoidable impacts.

Table III-1. UNAVOIDABLE ADVERSE IMPACTS AND IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES

Resource	Unavoidable Adverse Impacts	Commitment of Resources	
		Irreversible	Irretrievable
Air Quality	Estimated annual emission due to increased vehicular traffic generated by the possible new town (tons/day): TSP, 19; SO_2, 17; NO_x, 260; CO, 960; hydrocarbons, 151.	No	No
Paleontology	Adverse impacts to some paleontological resources which could be damaged or destroyed.	Yes	Yes
Soils	Accelerated erosion due to wind and water resulting in decreased soil stability, and decreased soil fertility and productivity.	No	Yes
Hydrology	Consumptive use of 15,000 ac-ft/yr of ground water; significant drawdowns in three aquifers; unknown reduction in flow from springs in the Chuska Mountains; decrease in natural ground-water discharge to local streams.	Yes	Yes
	Measurable land subsidence near the well field.	Yes	Yes
Wildlife	Increased hunting and fishing pressure would result due to increased population from the possible new town.	No	No
Cultural	Adverse impacts to some cultural resources which could be permanently lost and unavailable for future investigation.	Yes	Yes
Visual	The new town facility would exceed contrast ratings established for BLM class requirements.	No	No

Table III-1. UNAVOIDABLE ADVERSE IMPACTS AND IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES (concluded)

Resource	Unavoidable Adverse Impacts	Commitment of Resources	
		Irreversible	Irretrievable
Recreation	Increased use of the recreation base would result in increases in overcrowding, litter, fire, and uncontrolled ORV use. For those impacts which cannot be adequately supervised, adverse and unavoidable impacts would result.	No	No
Wilderness	The scenic character viewed from the Bisti and De-na-zin WSAs would be impaired, thereby adversely affecting the wilderness experience. Increased visitor use would result in impacts similar to those discussed for recreation resources.	No	No
Transportation	Delays and safety problems could result for local transportation routes that cannot accommodate projected traffic.	No	No

Cumulative Impacts

CUMULATIVE IMPACTS

INTRODUCTION

The proposed action discussed in this EIS is only one of several major resource commitments under consideration for the San Juan Basin for roughly the same time frame. By convention, impact analysis for any one proposed action is based on existing conditions, rational projections of these conditions into the future, and on new actions or projects that clearly are entrained in a development cycle (at the very least, approved and permitted for future implementation). Actions which may be highly probable for the future but are not yet approved are usually excluded from impact analysis. In the San Juan Basin, however, there is concern that the scale and simultaneity of several major proposed actions would lead to important cumulative impacts of a distribution and magnitude not contemplated by the EISs for the individual actions. To meet this concern, a cumulative impact study was conducted (called the Cumulative Overview), and its important findings have been summarized in this EIS. The Cumulative Overview is a companion document to these EISs and is filed with EPA as a part of each of them.

The three proposed actions considered in the Cumulative Overview (BLM 1982a) are the New Mexico Generating Station, the San Juan River Regional Coal Leasing, and Wilderness Area designation of the Bisti and De-na-zin Wilderness Study Areas. All three proposed actions would be implemented at roughly the same time, and some of the impacts of each action would overlap geographically or temporally with impacts from the other two proposed actions.

As used in the Cumulative Overview, cumulative impacts refer to "new" (previously undiscussed) information and are defined to be of two types:

1. Combinations of previously identified significant impacts (from individual EISs) that show increased levels of magnitude or severity from those presented in the EISs and that, therefore, represent qualitative changes in the bases for mitigation planning.
2. Combination of previously identified nonsignificant impacts that would occur coincidentally at sensitive or important locations, and in the aggregate would be considered significant.

This section is a summary of findings from the Cumulative Overview study. These findings are presented formally in the Cumulative Overview, and are supported by data and analytical descriptions presented in another document called Cumulative Overview Technical Report (BLM 1982b). Further detail on the other two individual proposed actions and their impacts is available in their respective EISs (BLM 1982c, 1982d).

This summary is organized into four subsections: this introduction, a review of the proposed actions, description of the portions of the environment affected by cumulative impacts, and a presentation of the cumulative environmental consequences.

Proposed Actions

Chapter 1 of this EIS provides a complete description of NMGS.

The San Juan River Regional Coal Leasing Program (SJRRCL) is a proposal to issue competitive coal leases on public lands in the San Juan Basin, beginning in 1983. The leasing would open from 1.2 billion to 1.5 billion tons of coal to production. The proposed leasing includes 24 tracts with estimated in-place

reserves of 1.32 billion tons. The EIS for SJRRCL also includes a discussion of a related proposal to issue noncompetitive federal coal leases on private and public lands in San Juan Basin areas where coal prospecting permits had been issued previously. Leases would be issued after defining the terms and conditions of each lease. This proposed action is called the Coal Preference Right Lease Applications (PRLAs) proposal, and could open about 2 billion tons of coal to production beginning in 1984.

The Wilderness Study Areas (WSAs) proposal involves three WSAs in the San Juan Basin, two of which are recommended for designation as Wilderness Areas, and both of which are close to NMGS. These are the Bisti and De-na-zin WSAs; together they encompass about 24,000 acres located north and east of NMGS. These WSA lands overlap in places with some PRLA tracts, and are close to other SJRRCL tracts.

AFFECTED ENVIRONMENT

Based on a preliminary analysis of the interactive effects of the proposed actions, nine impact topics were identified for further analysis. The affected resource groups are discussed briefly below.

AIR QUALITY

Air quality studies were concerned with the potential increase in concentrations of total suspended particulates (TSP). In a few small areas close to both NMGS and SJRRCL mines, there was concern that low-level dust concentrations from power plant and mining sources would combine to yield concentrations that would exceed prevailing standards. The study area for air quality was derived from dispersion modeling that delineated overlapping areas of measurable concentrations from both NMGS and SJRRCL; all mine locations within 25 km of NMGS were identified to be included in the analysis.

NOISE

Noise impacts were evaluated with respect to the WSAs. The concern was that the combined noise of blasting at mines, and haul road or worker traffic from both NMGS and SJRRCL mines, would be audible from within the WSAs and would degrade the quality of the wilderness experience to users of those areas. The study area included the Bisti and De-na-zin WSAs, and roads and mines within about 20 km of NMGS.

CULTURAL AND PALEONTOLOGICAL RESOURCES

The San Juan Basin presents an extensive body of physical evidence of a culture history dating back 10,000 years or more. The potentially affected cultural resources mainly are archaeological sites; other resources (objects, structures, or places) that have sociocultural significance to American groups are also potentially affected. Paleontological resources consist mainly of extensive fossiliferous beds which are internationally known for their richness and diversity. Together, the cultural and paleontological resources of the San Juan Basin provide unusual opportunities for research and interpretation because of their abundance, regional extension, and temporal depth.

The emphasis of cumulative impact analysis is on modifications to these regional sets of resources, and the consequent enhancement or degradation of the special qualities and opportunities that these regional sets provide. The impacts of interest are "indirect" because they do not concern direct modifications of specific resources, but rather generalized modifications to a body of resources. As a matter of subtle emphasis, it is the corpus of resources that is of concern, more than the component parts. Actions that would produce these indirect effects are cumulative increases in population in the region, and a cumulative increase in the attention invested in these resources by public agencies, in anticipation of and in response to the several proposed actions. The study area includes all of the San Juan Basin and extends into neighboring areas within one day's recreational drive (100 miles) of primary residential communities, particularly Farmington.

VISUAL RESOURCES

The concern of cumulative impact analysis for visual resources is increased visual contrast, as seen from a number of

key viewing points, resulting from the combined landscape-altering actions of proposed actions. Key elements of the affected environment in this analysis are the viewing points (within WSAs, designated park and recreation areas, highway access points, and other scenic areas), the expected modification (addition of structures, or changes to land, water, or vegetation elements of the landscape), and the limited areas within which modification from more than one project are visible from the selected viewing points. Because one of the proposed actions (designation of Bisti and De-na-zin WSAs as Wilderness Areas) is based partially on preservation of scenic quality, the delineation of areas where combined landscape modifications would occur considers only the effects of NMGS and SJRRCL.

The study area for cumulative visual impacts consists of overlapping portions of areas close to both NMGS and SJRRCL project features that are also visible from key viewing points within or adjacent to high quality scenic areas. The critical viewing distance from NMGS or SJRRCL features was a function of the degree of visual contrast associated with specific project features (e.g., stack, transmission line, mine pit, etc.).

RECREATION AND WILDERNESS RESOURCES

In addition to the two WSAs of direct concern, there are seven other WSAs within a day's recreational drive of the primary residential communities, along with numerous other recreational places ranging from important cultural sites (Chaco Culture National Historical Park) to national forests and state parks. Cumulative impact analysis was concerned with the potential loss or degradation of these recreation and wilderness areas, or with the degradation of their essential characteristics, resulting from an increased regional population and its demand for and use of these resources. The study area focused on the San Juan Basin, but also considered recreation user opportunities within 100 miles of Farmington and Grants.

TRANSPORTATION

Cumulative impact analysis focused on projected traffic volumes associated with the combined work forces of NMGS and SJRRCL, and the abilities of the area's existing roads to handle these higher volumes efficiently and safely. The study area was based on a projection of worker commute patterns; the roads of greatest interest were NM 371 from Farmington south to county roads C-5 and C-14, and portions of NM 44. Municipal roadways in the Farmington area were considered also.

SOCIAL AND ECONOMIC CONDITIONS

The NMGS and SJRRCL projects would produce changes in the region's population and potential economic structure. These changes, in turn, would alter population and economic characteristics, and the levels of demand for housing, infrastructure, and services. The cumulative impact analysis is concerned with the combined effect of these projects on the human environment (primarily communities) and on the institutions created to support it. When NMGS and SJRRCL are considered jointly over the years of their construction and operation, both the magnitude and timing of impacts change from what is reported at the individual project level in this and the other EIS. These cumulative impacts present a qualitatively different basis for mitigation planning from that which is presented for the two projects individually.

Preliminary analysis showed that the Farmington area was likely to attract direct and secondary population from both projects (Grants and Gallup are expected to be affected primarily by SJRRCL and not NMGS). Therefore the study area was limited to Farmington-area communities.

ENVIRONMENTAL CONSEQUENCES

Cumulative impacts were found to be greater or more severe than the simple sum of impacts reported for individual proposed actions; for all resources, cumulative impacts were determined to be significant. Table CI-1 is a summary of findings from the cumulative impact analysis. Brief descriptions of the for each resource are presented below.

AIR QUALITY

Increases of ambient total suspended particulate (TSP) concentrations

Table CI-1. SUMMARY OF AFFECTED RESOURCES CONSIDERED IN THE CUMULATIVE OVERVIEW

Resource	Study Area	Impact Topic	Indicator of Significance	Findings
Air Quality	12.5 km radius from NMGS, overlapping TSP contours from NMGS and SJRRCL. All mine locations within 25 km of NMGS were identified to include in the analysis.	Increase in total suspended particulate (TSP) concentrations from fugitive dust and stack emissions.	Concentrations ($\mu g/m^3$) in excess of any 24-hour or annual standard.	One small area close to Bisti mine No. 1 may experience TSP concentrations in excess of a standard; The potential for additional concentrations in excess of standards may occur in a worst-case situation in which a PRIA mine is located close to another mine (i.e. 1 km or less).
Noise	The study area included Bisti and De-na-zin WSAs, and mines and roads within 20 km of NMGS.	Increased noise levels from blasting, haul trucks, and employee-related travel.	Increment of 9 dB(A) above baseline noise levels in WSAs.	Increases in hourly noise levels greater than 9 dB(A) over baseline is predicted at the boundary of De-na-zin WSA, as a result of worker and haul road traffic in excess of 700 vehicles per hour on C-15.
Cultural and Paleontological Resources	Resources within 100-mile radius of greater Farmington area.	Primarily, indirect effects of increased exposure of resources to an increased population (i.e. vandalism, commercial looting, inadvertent damage) as well as deliberate conservation and interpretation of some resources.	Due to large numbers of sensitive resources and their prescribed significance (36 CFR 60.6, PL96-550, AIRFA, etc.), all adverse cumulative impacts are considered to be significant.	Impacts include conservation of some resources through land withdrawal, and preservation of important information through its acquisition and synthesis in connection with mitigation. Consumption of the resource base through research and mitigation activities, and loss of some resources to purposive or inadvertent disturbance of sites by a larger population.
Visual Resources	Overlapping portions of areas within selected visual ranges (3-10 miles) of NMGS and SJRRCL project features, which also are visible from key viewing points (primarily from WSAs, designated park and recreation areas, highway access points, and other scenic areas).	Degradation of scenic quality within the critical viewing distance from WSAs and other regionally important locations (e.g., cultural sites), due to landscape modifications from combined NMGS and SJRRCL actions.	Numerical contrast rating thresholds in the BLM VRM system (exceedence of any established threshold was considered to be significant).	Impacts from seven key viewing points, most significantly along the northern side of Chaco Culture National Historical Park, from within the WSAs, and at highway access points to these areas.

Table CI-1. SUMMARY OF AFFECTED RESOURCES CONSIDERED IN THE CUMULATIVE OVERVIEW (Concluded)

Resource Type	Study Area	Impact Topic	Indicator of Significance	Findings
Recreation/ Wilderness	Recreation areas and all WSAs (9 areas) within 100-mile radius from Farmington and Grants.	Loss or degradation of recreation or wilderness resources or their essential characteristics, primarily as a result of an increased regional population and its consequent demand for and use of these resources, or their close proximity to SJBAP actions.	Loss or degradation of resource areas from crowding of recreation facilities (based on unit-use standards); any degradation of essential environmental qualities (scenery, noise) associated with high quality recreation and wilderness experiences.	Degradation of the quality of wilderness experience in Bisti and De-na-zin WSAs, overcrowding of recreation areas close to Farmington and Grants, and degradation in the quality of dispersed recreation activities in the region.
Transportation	Roads and railroads linking Farmington area communities with Gallup and Grants-area communities. Includes all roads and railroads that provide access to NMGS and SJRRCL components.	Increased traffic volumes and safety hazards on existing roadways.	Increase in peak volume greater than peak volumes estimated for NMGS or SJRRCL individually, and close to, or greater than, designed roadway capacity or surface structure tolerance.	Significant overloading of NM 371 between Farmington and NMGS site.
Social and Economic Resources	Communities in the greater Farmington area (Farmington, Aztec, Bloomfield, Flora Vista, Lee Acres, and Lower Valley) where allocation of the combined increases in population from NMGS and SJRRCL have been made.	Employment, population growth, housing, community infrastructure and services, and public finances.	10 percent annual growth rate or greater in population or public revenue. Shortfall of projected public revenues to meet projected demands, or inability of private sector to meet such demands. Demand for community facilities and services (housing, municipal services, education, health and and human services, police and fire protection, recreation) in excess of existing and projected supply.	Significant population growth in 1985-86, significant expansion of regional economy from 1985-1995, excess housing demand in mid '80s and early '90s, shortfall of projected human services to demand. San Juan County would experience a slight deficit (approximately $17,000) in overall operating funds in 1984-85, and surpluses thereafter which could reach $2.6 million in 2000.
	Portions of San Juan Basin occupied and used primarily by the Navajo.	Opportunities to pursue traditional Native American values and lifestyles.	Reduction of opportunities to pursue traditional values and lifestyles.	Unquantified, but probably significant reduction in opportunities to pursue traditional lifestyles.

resulting from mining operations were projected by dispersion modeling for each mine, added to the modeled concentrations from NMGS, and then added to background levels. The results of this analysis are below all applicable national ambient air quality standards for TSP and the 24-hour New Mexico TSP standard. Total predicted levels of TSP in excess of the annual New Mexico standard (60 $\mu g/m^3$) were indicated in a small area within 2 kilometers from one mine boundary. It is not known at this time whether this area would be classified as "ambient air" (i.e., air to which the general public has access), since mine boundaries associated with PRLAs are not as yet defined. However, under worst-case assumptions, this exceedence of the annual New Mexico standard would constitute a significant impact. Significant TSP impacts were found for the air quality analysis in the SJRRCL EIS. Beyond this one minor area, the additional consideration of TSP levels related to NMGS did not combine to produce significant effects in the limited geographic area of TSP interaction for the two proposed actions.

NOISE

The combined noise effects of haul truck traffic (from both NMGS and SJRRCL mines), employee-related traffic from all projects, and blasting at the mines was considered in relation to its perception by users of the Bisti and De-na-zin WSAs. The analysis recognized that most of the people subject to project-related noise would be employees of these projects; noise impacts to employees are managed under environmental health and safety regulations, and it is assumed that "on-site" noise will be confined to levels that are not significant by regulatory definition, or are mitigated at the receptor.

Increased hourly noise levels greater than 9 dB(A), which roughly represents a doubling of perceived noise, were considered to be significant. Based on this indicator, significant noise impacts are projected in the wilderness assessment to occur at the boundary of Bisti WSA closest to NM 371 and the boundary of De-na-zin closest to county road C-15. From some locations within these WSAs, increased noise levels greater than 9 dB(A), resulting from traffic along the two above-mentioned roads, are projected to occur. These noise impacts could be lessened by reducing the number of vehicles, or by routing traffic away from sensitive areas.

CULTURAL AND PALEONTOLOGICAL RESOURCES

The following impacts were identified.

1. Conservation of resources within designated wilderness lands or in other specified areas, with well-planned withdrawal of information from these resources thorugh research and interpretation.
2. Acquisition and synthesis of signifi cant research information about the cultural and paleontological resources of the San Juan Basin, wheth er as part of well-scheduled data recovery prior to disturbance, or as emergency recovery of information and materials disturbed during project operations.
3. Consumption or depletion of a portion of the general San Juan Basin cultural and paleontological resource base, thus elevating the significance of remaining materials and traditions. Information gathered as a beneficial effect may be of diminished value to future researchers with as yet unknown research interests.
4. Increased uncontrolled loss of the cultural and paleontological resource base through inadvertent and malicious vandalism, commercial looting, and natural erosion of otherwise undisturbed sites because of increased local populations.

VISUAL RESOURCES

Based on an evaluation of visual contrast ratings of landscapes that would be modified by combined NMGS and SJRRCL features, and viewed from high-quality scenic areas, changes in visual resources were compared to Visual Resource Management objectives (according to the BLM-VRM system) for different classes of resources. Six adverse impacts were identified. They include significant degradation of visual quality of the landscape

as viewed from two locations on the northern side of Chaco Culture National Historical Park (Pueblo Alto and Pueblo Pintado), generalized reduction in visual quality from several locations within Bisti and De-na-zin WSAs (NMGS and SJRRCL features will be visible in many viewing directions from within these areas), and high contrast impacts on highway approaches to both the WSAs and Chaco Culture National Historical Park. Some mitigation may be achieved by softening the visual contrasts resulting from power transmission lines and surface mines, through design and cosmetic treatments. BLM could encourage visitor use in the enclosed portions of WSAs where natural features would buffer surrounding landscape disturbances.

RECREATION AND WILDERNESS RESOURCES

Based on the projected distribution of a significantly increased regional population, estimates were made of the probable demand for and participation in several recreation activities. It was assumed that high-quality recreation areas close to Farmington would be affected first, and that user preferences for recreation resources of the same class and quality would diminish generally with distance. Using this appproach, several recreation areas were predicted to become overcrowded, and thus potentially susceptible to degradation. In addition, direct impacts to recreation and wilderness areas close to NMGS and SJRRCL were considered, not so much from the standpoint of heavier visitation, but rather in relation to the findings of other resource analyses (visual resources, noise, etc.).

The assumption that users would seek more distant but equivalent recreation experiences if nearby areas were crowded is less plausible for the cumulative impact analysis than when only one project was considered. Recreation use associated with SJRRCL would tend to concentrate in the southern San Juan Basin, while users related to NMGS would tend to seek recreation areas nearer to Farmington. When both projects are considered together, all recreation resources in the Basin would be sought after and stressed at the same time, with few better prospects for a quality recreation experience available except at more remote locations, substantially outside of the Basin. The most seriously overcrowded areas in the Basin are likely to be Navajo Lake State Park, Angel Peak Recreation Area, Bluewater Lake State Park, and the Chaco Culture National Historical Park.

As pointed out in the discussions of impacts concerning visual resources and noise, some degradation in the quality of wilderness experience is expected within both the Bisti and De-na-zin WSAs.

TRANSPORTATION

Traffic volumes on roadways in the San Juan Basin were projected by combining worker commute volumes developed in the analysis of social and economic conditions, and haul truck volumes estimated in the noise analysis. These data were assembled for specific roads (according to projected commute patterns and mine locations) and for each year of operation of the NMGS and SJRRCL projects. Since transportation effects of either NMGS or SJRRCL would be significant without the influence of the other project, any increase in projected volume over site-specific EIS estimates was considered to be significant.

The most significant impact is projected to occur on NM 371 between Farmington and the NMGS plant site, where traffic volumes are likely to be about 100 percent greater than projected by the State Highway Department, and about 60 percent over standard maximum capacity for a roadway of that size and duty type. Since the magnitude of the cumulative impact is so great, consideration should be given to expanding the roadway from 2 lanes to 4 lanes.

SOCIAL AND ECONOMIC CONDITIONS

Cumulative impact analysis focused on two topics: rapid growth in the region, and the ability of communities to respond in a timely fashion with housing, services, and facilities; and decreased opportunities for the pursuit of traditional Native American values and lifestyles. The initiating event that would cause rapid growth and its consequences is an increase in employment

opportunities resulting from simultaneous development and operation of NMGS and SJRRCL. Together, the two projects would add approximately 9000 direct jobs at peak, generating, in addition, about twice that number of indirect jobs. About one-third of the population associated with these jobs would seek residence in the southern part of the region (centered on the Grants-Gallup axis), and would be a result primarily of SJRRCL mining activity, with or without NMGS. Therefore, the cumulative impact analysis focuses on communities affected by the joint employment opportunities of both NMGS and SJRRCL; these communities are located in the Farmington area.

Farmington area communities would be affected by about 6000 additional direct jobs and 12,000-13,000 indirect jobs. Consequent to the creation of employment opportunities affecting these communities would be increases in aggregate personal income and sharply increased demands for housing, infrastructure, and human services. Public finances would be affected in response to increased demands and increased public revenues from the new population. Traditional Native American values and lifestyles would be affected through a combination of a changing population composition, increased income, increased mobility, and a diminution of traditional support mechanisms (credit, public assistance, etc.).

The significant impacts were estimated to be:

1. Population growth in Farmington in 1985-86 at rates greater than 10 per cent per year. These growth rates are likely to be stressful to community resources, and may prefigure adverse social and economic conditions for several years beyond the periods of fastest growth.
2. Significant expansion of the regional economy from the mid-1980s through the 2020s, as measured in terms of employment, income, and public revenues. San Juan County would experience a slight deficit ($17,000) in overall operating funds in 1984-85 and surpluses thereafter which would reach $2.6 million in 2000.
3. Excess housing demand in the Farmington area in the 1985-1995 period.
4. Potential inability of human service agencies to keep pace with demand.
5. Unspecified but potentially significant impacts to Native Americans (especially Navajo), generally related to decreased opportunities to pursue traditional Native American lifestyles.

Chapter 4

Chapter 4
CONSULTATION AND COORDINATION

THE SCOPING PROCESS

The Council on Environmental Quality Regulations Implementing the National Environmental Policy Act (40 CFR, Part 1501.7) require an early and open scoping process. During this process, the scope and importance of issues related to the Proposed Action were identified. Information obtained during the scoping process was one of the sources used to determine which impact topics would be addressed in detail in this EIS. Additional purposes of the scoping process were to inform affected federal, state, and local agencies and other interested parties about the proposed project, and to identify existing environmental reports and information related to the impact assessment.

The scoping process involved discussions with the public and resource specialists and managers of BLM and other relevant agencies. Written comments were received and compiled as a result of A-95 Clearinghouse distribution, Federal Register announcements, news releases, mailings, and articles about the proposal. Comments were also solicited during public scoping meetings. In addition, the initial scoping effort has been followed by an effort to continue agency and public involvement throughout the development of this EIS. This section outlines the steps taken by BLM for the scoping and public involvement process for the EIS.

An initial mailing list of more than 3000 names was developed to distribute information about the proposal and to inform the public about planned scoping meetings. A follow-up mailing of nearly 2000 letters (to individuals who had expressed interest) was made, reminding the public of the meetings. These meetings were announced in the Federal Register, news releases, and radio spots in both the English and Navajo languages.

A total of 16 scoping meetings were held. This scoping effort (the initial public involvement during the environmental process) was an attempt to scope the major issues, alternatives, and concerns for the EIS and Cumulative Overview. These activities ranged from a meeting with affected state legislators to meetings open to the general public.

Several scoping meetings designed for specific audiences were held to obtain information. All the meetings were open to the general public; however, each meeting was specifically oriented to one of the following groups:

1. General public
2. Native Americans
3. Local agencies
4. State agencies
5. Federal agencies

At all scoping meetings an introduction and summary of the NMGS proposal and the Cumulative Overview was presented. This summary was followed by slide and tape presentations that detailed the activities within the San Juan Basin. A Navajo-language tape was prepared for the meetings with Navajo chapters. For the federal, state, and local agency meetings and the Native American meetings, a question-and-answer period followed, allowing comments on major issues, concerns, and alternatives. At public meetings, a facilitator/nominal work group approach was used. This consisted of participants gathering into groups of 10 to 20 people, with 2 facilitators to moderate and document the issues and concerns. A summary of all issues and concerns

was published and is available upon request from the BLM New Mexico State Office (NMSO) (Scoping Analysis and Public Involvement, May 1981). Summaries of the meetings follow.

Federal Agency Meeting

On January 12, 1981, in Albuquerque, New Mexico, 11 representatives of federal agencies, including the National Park Service, Geological Survey, and Fish and Wildlife Service, attended a scoping meeting. Major issues raised included numerous air quality issues, coal source questions, and questions pertaining to the need for the project. Air quality concerns focused on regulatory mandates for "best available control technology" and compliance with both federal and state requirements.

State Agency Meeting

A meeting was held January 13, 1981, in Santa Fe, New Mexico, for state agency representatives. Participants included representatives from the State Planning Division, Natural Resources Department, State Highway Department, State Engineer, and Institute for Regional Education.

Major issues raised related to the availability of adequate water, including the potential loss of water to current users. The content of the Cumulative Overview was discussed, and concerns were raised about whether uranium, oil, gas, and other development would be incorporated into the Cumulative Overview. Additional questions and issues related to work-force requirements, increased population effects, and the possible new town.

Local Agency Meeting

A meeting held January 15, 1981, in Farmington, New Mexico, was attended by 12 representatives of local and regional agencies. Representatives of San Juan County, the Farmington School District, the City of Farmington, and the local Bureau of Indian Affairs Office attended.

Major concerns involved coordination with local agencies, jobs, and coal development. Questions relating to the development of EISs for coal mines were raised. Participants wanted to know who has the responsibility for site-specific mine plan EISs. People were also interested in knowing exactly where the mines would be located.

Local officials were very interested in the potential number of jobs that could be generated and the timing of these jobs. The local officials also expressed a desire to be kept involved throughout the process. An additional meeting was held with state legislators from San Juan County. The major interest expressed was in being kept informed.

Navajo Meetings

Four meetings at Navajo chapter houses in New Mexico were held during the week of January 19, 1981, as follows:

- Crowpoint, January 19
- Lake Valley, January 20
- Huerfano, January 21
- Pueblo Pintado, January 22

Approximately 300 Navajo people attended these sessions. The presentation was given in the Navajo language.

Major issues raised during these sessions included the expressed desire to be involved in the process, concern about an influx of non-Navajos into the area, air quality, water quantity and quality, and interest in the protection of sacred sites and areas.

Jicarilla Apache Meeting

On February 25, 1981, a session was held at Dulce, New Mexico, with representatives of the Jicarilla Apaches. Members of the tribal council, the Bureau of Indian Affairs, and Jicarilla Apache Tribal Consultants were among the 23 participants. Major concerns were about potentially reduced air quality and potential secondary impacts derived from increased population.

Participants felt that the addition of another generating station would significantly contribute to air quality degradation in the area. They expressed the desire to have the areal extent of BLM's analysis include the Jicarilla Apache Reservation.

Concerns about the possible impacts of increased population on roads, wildlife, recreation, water quality, and health and safety on the reservation were also raised.

Public Meetings

Meetings designed for all interested parties were held at several locations during the first week of February 1981 and in Taos, New Mexico, on February 23, 1981. These meetings were publicized by a major informational mailing and through the media. The meetings were held as follows:

- Albuquerque, February 3: afternoon, 90 participants; evening, 55 participants
- Gallup, February 4: afternoon, 23 participants; evening, 10 participants
- Farmington, February 5: afternoon, 36 participants; evening, 45 participants
- Taos, February 23: evening, 58 participants

The major issues raised included questions of procedure, purpose and need, potential social impacts, water, and air quality.

Procedural questions generally focused on the proposed Ute Mountain Land Exchange EA. A large number of participants, particularly at the Albuquerque and Taos meetings, felt that by not including the proposed exchange in the EIS, a predetermination could be assumed. These people expressed the view that the Ute Mountain Exchange was the major driving force behind the NMGS proposal, and a similar concern was expressed about the PRLA EA.

During the Farmington meetings, a sentiment to speed up the procedure was widely expressed. Many participants wanted the proposed time frames shortened. Many of these participants were concerned that a long period of time between the imminent completion of the San Juan Generating Station and start of construction of the proposed NMGS could contribute to a "boom-bust" cycle in Farmington.

In Albuquerque and Taos, a number of questions about the need for NMGS were raised. This concern revolved around expressed skepticism about PNM's load forecasts and the participants' views that alternative renewable energy sources (solar and wind) and conservation could meet future need. The concept of out-of-state sales was also questioned at some length. Related to this overall concern was a desire to have independent need studies included in the decision process.

A great deal of comment was raised about social impacts at all sessions. These comments dealt with potential impacts to Native Americans in the area and concern about potential effects on existing social services (sewer, water, schools) in Farmington and Bloomfield.

Questions and concerns about water quantity and quality were major points of discussion. Numerous participants stated that the San Juan River was currently over-allocated and that any additional use of the water could have severe impacts on downstream users. The alternatives of using ground water or water from uranium mines were also controversial topics. Potential adverse impacts from ground-water drawdown were described, as well as a fear that water from uranium mines would not be adequately treated and that radionuclides could be introduced to the plant and its environment. Numerous questions were also raised about possible impacts to water quality caused by acid deposition from the proposed plant, coal mine runoff, and other activities in the area.

Air quality impacts mainly associated with the proposed NMGS were discussed at length. Concerns included acid precipitation, general degradation of air quality, and the "greenhouse effect" on world climate.

Written Comments

In addition to comments received at the meetings, the BLM received approximately 75 written comments. Major issues raised in the letters reflected concerns similar to those expressed at the Taos and Albuquerque meetings. The written comments also focused on potential impacts to archaeological and paleontological resources.

ADDITIONAL AGENCY INVOLVEMENT

After the initial set of scoping meetings, a number of special activities were undertaken to further involve other agencies. Additional agency involvement was obtained through either formal or informal Cooperative Agreements.

The primary purpose of Agency Cooperative Agreements is to ensure that the agencies' expressed issues and concerns are adequately addressed in the EIS and that agencies with jurisdictional concerns or expertise provide input into the environmental process. This was accomplished through input and review of data collection plans, technical reports, and the EIS. For agencies that have additional permitting requirements, this EIS would serve as the primary environmental analysis, thereby reducing duplication of effort. (Cooperating Agencies are listed on the back of the title page.) In addition to the formal cooperative agreements made with agencies, a number of other agencies were consulted to obtain data and information relevant to the analysis.

Meetings of representatives of formal and informal Cooperating Agencies were held in Santa Fe on March 25, May 5, and August 17, 1982. The purpose of the meetings was to give status reports on this EIS process, to consult the agencies on their review of the Preliminary DEIS (PDEIS) and Technical Reports (TRs) during May and June, and to solicit their comments and preferences on the assessment results and alternatives. A complete record of those contacts and the information and data provided is available at the BLM NMSO in Santa Fe.

Table 4-1 indicates the formal (*) and informal Cooperating Agencies and the documents they reviewed (PDEIS and TRs). The table also indicates documents for which agencies provided specific review comments during development of the Draft EIS (DEIS) and its associated TRs.

ADDITIONAL PUBLIC INVOLVEMENT

Because of the long EIS preparation time, it was determined that public involvement would be needed in addition to the initial public scoping process. Public involvement consisted of meetings with individuals and interested groups on a request basis and another set of formal public meetings held in March 1982.

Meetings with Interested Groups

Several meetings were held in BLM offices in Santa Fe with representatives of Southwest Research and Information Center and the Committee on Coal. These meetings were held to discuss BLM's approach to the EIS. Specific topics included purpose and need, alternatives, and procedural questions. Records of these meetings are available in files at the BLM NMSO. These contacts will continue throughout the environmental analysis and decision-making process.

Public Meetings

Three public meetings were held in the first week of March 1982.

- Taos, March 1, 75 participants
- Farmington, March 3, 55 participants
- Albuquerque, March 4, 65 participants

Representatives of BLM, PNM, and WCC presented status reports on the progress of the EIS and related projects, in the San Juan Basin, agency involvement, PNM's planning efforts, alternatives under consideration, and future plans.

Major areas of questioning were: need for the project, procedural issues, BLM's site selection review process, alternatives to meet the project need, and environmental issues related to air, water, cultural resources, Chaco Culture National Historical Park, Wilderness Study Areas (WSAs), and social and economic effects in the proposed plant site area and Farmington vicinity.

PUBLIC AND AGENCY REVIEW OF THE DEIS AND TECHNICAL REPORTS

Release of NMGS Technical Reports (TRs)

The 22 TRs developed as a basis for writing the DEIS were released for public review and comment on October 19, 1982. The availability of these reports was announced through the Federal Register (Vol. 47, No. 216, Monday, November 8, 1982, pp. 50563-65), notices to the local media, and letters to cooperating agencies.

Table 4-1. COOPERATING AGENCY REVIEW OF NMGS PRELIMINARY DRAFT EIS AND ASSOCIATED TECHNICAL REPORTS

Cooperating Agency	PDEIS	Air Quality	Geologic Setting	Mineral Resources	Paleontology	Soils, Prime & Unique Farmlands	Hydrology/ Water Quality	Vegetation	Wildlife & Aquatic Biology	Cultural Resources	Visual Resources	Recreation	Wilderness	Transportation	Social & Economic (incl. Native Amer.)	Land Use Controls & Constraints	Threatened & Endangered Species	Project Description	Purpose & Need	Alternatives to the Project
BIA, Albuquerque Area Office*	R/C	—	—	—	—	—	R/C	—	—	R/C	—	—	—	—	R	—	—	R	R	—
BIA, Eastern Navajo Agency*	R	R	R	R	R	R	R/C	R	R	R/C	R	R	R	R	R	R	R	R	R	R
BIA, Navajo Area Office*	R/C	R	—	R	R	R	R/C	R	R/C	R	R	—	—	—	R	R/C	R/C	—	—	—
Bureau of Reclamation*	R/C	—	—	—	—	—	R	—	R	R/C	—	—	—	—	—	—	R	—	—	—
Corps of Engineers*	R/C	R	R	R/C	R/C	R/C	R	R	R/C	R/C	R	R/C	R/C	R/C	R	R	R/C	R	R	R
Environmental Protection Agency	R/C	R/C	R/C	—	—	—	R/C	—	—	—	R/C	—	—	R/C	R/C	R/C	—	R/C	R	R
Fish and Wildlife Service*	R/C	R	—	—	—	—	R	R	R	—	—	R	—	—	—	R	R/C	R	R	—
Forest Service*	R/C	R	—	—	—	—	R/C	R/C	R/C	R	R/C	R/C	R/C	R/C	R/C	R	R/C	R/C	—	—
Minerals Management Service*	R/C	—	R/C	R/C	R/C	—	—	—	—	—	—	—	—	R	—	R	—	R	R	R/C
National Park Service*	R/C	R/C	R	R	—	R	R	R	R	R	R/C	R/C	R/C	R/C	R	R	R/C	R	R	R
Soil Conservation Service	R/C	—	—	—	—	R/C	R	R	—	—	—	—	—	—	R	R	—	R	—	—
U.S. Geological Survey	R	—	—	—	—	—	R/C	—	—	—	—	—	—	—	—	—	—	—	—	—
NM Energy and Minerals Dept.*	R	—	R	R	—	—	—	—	—	—	—	—	—	R	R	R	—	R	R	R
NM Environmental Improvement Div.	R	R/C	R	—	—	—	R/C	—	—	—	R	—	—	R	—	R	—	R	R	R
NM Natural Resources Dept.	R	—	—	—	—	R	—	R/C	R	R	R	R	R	—	—	R	R	R	R	R
NM State Planning Office	R/C	—	—	R	—	—	R	—	R	R/C	R	R	R	R	R	R	R	R	R	R
NM Public Service Commission	R	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	R	R	R
NM State Engineer's Office	R	R	—	—	R	—	R/C	—	—	—	—	—	—	—	—	—	—	—	—	—
NM State Historic Preservation Officer	R	—	—	—	—	—	—	—	—	R/C	—	—	—	—	R/C	—	—	—	—	—
Navajo Tribe*	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Zia Pueblo*	R	—	—	—	—	—	R	—	R	R	—	—	—	—	R	R	—	R	—	R

Note: * = formal Cooperating Agency.
R = reviewed by agency.
R/C = reviewed by agency; comments provided.
— = not reviewed.

The TRs were made available for public review and inspection prior to the release of the DEIS in order to allow the public as much time as possible to review the large volume of material (3560 pages). A list of TRs and their availability appears at the end of Chapter 4. Comments received on the TRs were included with those made on the DEIS itself. Changes and corrections to the TRs are included in the section on corrections to the DEIS and TR text.

Release of the DEIS

The DEIS was released for public review and comment on November 30, 1982. (All three EISs and the Cumulative Overview were released simultaneously.) Announcement of the availability of these documents was made in the Federal Register (Vol. 47, No. 23, Friday, December 3, 1982, pp. 54560-61) and through letters to Cooperating Agencies and news releases to the local media.

A 90-day public comment period for the documents (including the NMGS EIS and associated TRs) was scheduled from November 30, 1982 to February 1983; however, due to the formal requests of the New Mexico Governor and Attorney General, as well as several requests from other organizations and individuals, a 60-day extension to the comment period ending on April 8, 1983 was granted by the BLM State Director. This extension was announced through news releases, letters, and in the Federal Register (Vol. 48, No. 9, Thursday, January 13, 1983, pp. 1551-1552).

Approximately 1600 copies of the DEIS were distributed to reviewing agencies, organizations, and the general public, including requests for copies filed after the initial mailing. Additionally, approximately 40 requests for copies of individual TRs or TR sets were filled. Copies of the DEIS and TRs were made available through the Government Printing Office Depository Library Network (DLN) and through public and university libraries throughout New Mexico.

Public Hearings and Other Meetings on the DEIS

Five open houses and three formal public hearings were originally scheduled for the NMGS EIS and the other documents. Two more public hearings were added to the schedule as part of the request for an extension of the comment period mentioned previously. The open houses were informal meetings primarily intended to inform the public and answer questions related to the proposals, whereas the public hearings were a formal mechanism for receiving oral and written testimony on the proposed projects. (Comments received at the open houses were, however, recorded and included with the other comments received during the review period.)

OPEN HOUSES

Date	Location	Time	Attendance
12/14/82	Albuquerque, Convention Center	3-9 p.m.	50
12/14/82	Farmington, Civic Center	3-9 p.m.	120
12/15/82	Crowpoint, Navajo Chapter House	3-9 p.m.	150
12/16/82	Gallup, Holiday Inn	3-9 p.m.	60
12/16/82	Taos, Kachina Lodge	3-9 p.m.	50
		Total Attendance:	430

PUBLIC HEARINGS

Date	Location	Attendance	Speakers
1/10/83	Crowpoint, Navajo Chapter House	130	22
1/12/83	Farmington, Civic Center	115	34
1/14-15/83	Albuquerque, Convention Center	200	58
3/14/83	Santa Fe, Sweeney Convention Center	80	29
3/17/83	Pueblo Pintado, Pueblo Pintado Chapter House	200	33
	Totals:	725	176

In addition to the above meetings and hearings, 12 informal meetings were held with representatives of the BLM Farmington Resource Area Headquarters and various residents and surface owners of the San Juan Basin Area, primarily Navajos. These meetings were held primarily to ensure that the Native American community in the vicinity of the proposals were adequately involved and had every opportunity to air their concerns. Information developed through these meetings was included in the comments analyzed and responded to, as outlined in the following section.

INFORMAL SURFACE OWNER CONSULTATION MEETINGS

Date	Location	Attendance
12/ 27/82	White Rock	60
1/13/83	Crownpoint	28
1/14/83	Crownpoint	32
1/17/83	Redrock	16
1/19/83	Ojo Encino	19
1/21/83	Huerfano	81
2/23/83	Redrock	40
3/2/83	Ojo Encino	11
3/3/83	Huerfano	21
3/4/83	Crownpoint	7
4/11/83*	Lake Valley	25
4/21/83*	Counselor	35
	Total:	375

* Requested after close or public comment period, April 8, 1983

Several informal meetings were held with the cooperating agencies during this period to provide an opportunity for review of comments and responses. In addition, on April 14, 1983 BLM conducted a briefing on the status of the FEIS with the cooperating agencies. Meetings were also held with the FWS and the BIA (April 14 and 19) to discuss comments on the Threatened and Endangered Species TR and the preparation of the Biological Assessment.

COMMENT ANALYSIS AND RESPONSE

As part of the analysis and response to comments, the following terminology was used in reference to the materials received through the public comment period.

- Inputs: The number of inputs refers to the number of letters, petitions, hearings testimony, and exhibits received by BLM.

- Commenters: Individuals who signed letters, petitions, resolutions, etc.; those who spoke or submitted exhibits at the public hearings; those who provided information at the open houses or informal surface owner meetings.

- Comments: Refers to individual remarks or statements made within an individual input.

- Substantive Comments: As defined by the CEQ Regulations (40 CFR 1503.3), those comments that addressed ". . . either the adequacy of the statement, or the merits of the alternatives, or both."

This terminology was used consistently for all documents throughout the public comment analysis and response process described below. Comments received after the close of the public comment period (April 8, 1983) will still be analyzed and considered as part of the BLM decision-making process; however, these inputs may have been received too late for their comments and the responses to appear in this final EIS. In these cases, responses to these inputs will be made on an individual basis and forwarded to the commenters.

Because of the large volume of material associated with the 3 EISs plus 22 TRs and a Cumulative Overview and its TR, a centralized system for receiving and distributing comments was developed using the BLM's NMSO Public Affairs Staff as the initial receiving point for all inputs. The Public Affairs Staff performed the initial evaluation of all inputs, assigning the inputs to the appropriate EIS Team and marking the comments within each input. A sequential numbering system was developed to identify each input and commenter.

After the initial evaluation, inputs were distributed to the individual teams responsible for each EIS for formal analysis of substantive comment.

Overall, approximately 537 inputs from 923 commenters were received. For the NMGS EIS, there were approximately 329 inputs from 403 commenters containing 1170 substantive comments. The areas of most concern within the NMGS proposal (and the number of substantive comments in each area) were as follows:

1. Hydrology/ Water Quality - 195
2. Air Quality - 140
3. Purpose and Need - 135
4. Alternatives - 134
5. Social and Economic Conditions - 94
6. Native American Concerns - 77
7. Procedural Concerns - 48
8. Cultural Resources - 48
9. Proposed Action - 48
10. Wildlife, Aquatic Biology - 27

Because well over 3000 pages of hearings testimony, comment letters, petitions, and meeting notes were received on the three proposals, it was determined that individual response to each substantive comment and reproduction of each letter received would result in documents which were too large and not cost-effective (considerations mandated by the CEQ regulations). Therefore, similar comments were grouped and one summarizing comment was developed for each group of similar comments wherever possible.

The following list identifies all those who made substantive comments on the NMGS EIS along with their sequential identification number. The identification number is also listed below each comment in the following comment and response section to identify those who made the particular comment. (The complete set of hearings testimony, comment letters, meeting notes, and the master tracking chart developed for the NMGS EIS are on file at the BLM NMSO, Case File NM 30840, and are available for public inspection.)

LIST OF NMGS SUBSTANTIVE COMMENTERS

Commenter Identification #	Commenter	Areas of Substantive Comment
1	Dr. E.A. Scholer	Cultural Recreation Wildlife
3	Richard Perkins	Purpose and Need
9	Navajo Area Director, Bureau of Indian Affairs (BIA)	Proposed Ute Mountain Land Exchange Native American Concerns Threatened and Endangered Species Cultural Resources Transportation
10	Dr. George Greer	Proposed Action
11	Dana M. Ryan	Purpose and Need Procedural
16	Santa Fe Mining, Inc.	Transportation
17	Monroe Poteet	Purpose and Need Alternatives Air Quality Hydrology
24	Thomas Austin	Purpose and Need Alternatives Procedural Air Quality
26	Mary G.P. Hall	Air Quality
28	NM Bureau of Mines and Mineral Resources	Hydrology Visual Resources
31	NM Department of Game and Fish	Wildlife

LIST OF NMGS SUBSTANTIVE COMMENTERS (continued)

Commenter Identification #	Commenter	Areas of Substantive Comment
34	John D. Witt	Native American Concerns
37	Mark and Betsy Watson	Purpose and Need
44	NM Highway Department	Transportation
45	Walton Hawk	Procedural Alternatives
49	David M. Brugge	Native American Concerns
52	Patricia A. D'Andrea	Purpose and Need Proposed Action Hydrology
60	Ike Halliday	Proposed Action Air Quality
75	George E. Yazzie	Hydrology
90	Tamara Wiggins	Purpose and Need Alternatives Procedural Air Quality Hydrology Reclamation
92	Hugh M. Plummer	Procedural
95	John Perry, Jr.	Native American Concerns
96	Tom Becenti	Native American Concerns
98	Raymond Arviso	Livestock Grazing
100	Velma Arviso	Social and Economic Conditions

LIST OF NMGS SUBSTANTIVE COMMENTERS (continued)

Commenter Identification #	Commenter	Areas of Substantive Comment
103	Carol Kaping	Air Quality
105	Frank Chee Willeto	Purpose and Need Hydrology Native American Concerns
106	Dr. Robert Williams	Social and Economic Conditions
109	Carol Garner	Social and Economic Conditions
110	Mary Ellen Wojtasiewicz	Editorial/Graphics
111	Brian Chanatry	Hydrology
113	Paul Fyfe	Alternatives Editorial Air Quality Possible New Town
115	Mimi Lopez	Procedural Hydrology Social and Economic Conditions
117	John Sledd	Purpose and Need Procedural
118	Southwest Research Information Center (Hearing Exhibit #1) Crownpoint Hearing 1/10/83	Environmental Consequences Procedural Air Quality Social and Economic Conditions
124	Pat Wainwright	Paleontology Social and Economic Conditions
125	John Redhouse	Procedural
126	Dave Glowka	Purpose and Need

LIST OF NMGS SUBSTANTIVE COMMENTERS (continued)

Commenter Identification #	Commenter	Areas of Substantive Comment
128	Klara Kelly	Cultural Resources Native American Concerns
131	Milo Conrad	Air Quality Possible New Town
131a	Milo Conrad	Possible New Town
132a	Arch McCallum	Proposed Action
133	Dave Marcus	Purpose and Need Alternatives
133a	David Marcus	Purpose and Need Proposed Action Alternatives Procedural Air Quality Hydrology
143	Barry Kues	Paleontology
145	Scott Portman	Air Quality Reclamation
152	David Brugge	Social and Economic Conditions
153	Bruce Grove	Hydrology Native American Concerns
156a	Corry McDonald	Alternatives
160	Jeff Boyer	Cultural Resources Native American Concerns
160a	Jeff Boyer	Cultural Resources Social and Economic Conditions
161	Robert Nordhaus	Hydrology Native American Concerns

LIST OF NMGS SUBSTANTIVE COMMENTERS (continued)

Commenter Identification #	Commenter	Areas of Substantive Comment
162	Arnold Cassador	Air Quality Native American Concerns
163	Joan Price	Air Quality
164	Elouise Jacobson	Paleontology
164a	Eastern Navajo Land Commission (Exhibit 2B) Crownpoint	Procedural
165	John Teague	Air Quality Hydrology Socioeonomics
165a	Dr. Robert Williams (Exhibit 3)	Social and Economic Conditions
166	Crownpoint Citizens Alliance (Exhibit 4)	Social and Economic Conditions
167	Pat D'Andrea	Purpose and Need Hydrology Social and Economic Conditions
168	Teresa C. Seamster	Purpose and Need Social and Economic Conditions Air Quality Cultural Resources
169	NM Department of Health and Human Services	Hydrology
169	David Williams	Alternatives Air Quality
171	Karen Brown	Air Quality
172	Barry Kues	Paleontology

LIST OF NMGS SUBSTANTIVE COMMENTERS (continued)

Commenter Identification #	Commenter	Areas of Substantive Comment
175	Larry Foster	Procedural Hydrology
175a	Larry Foster	Hydrology
178	American Citizens Together	Hydrology
186	Willie Blockie	Livestock Grazing
187	Tom B. Becenti	Native American Concerns
193	Mary Pioche	Air Quality Social and Economic Conditions
194	Arlene Luther	Proposed Action Procedural Hydrology Livestock Grazing
199	Richard Dice (Exhibit #14)	Authorizing Actions
201	John M. Crowl (Exhibit #16)	Air Quality
204	Anna Manana	Alternatives Hydrology
205	Lillian Tenopyr	Hydrology
226	USGS	Hydrology
229	Nicholas K. Lenssen	Purpose and Need Air Quality Hydrology Social and Economic Conditions
232	Museum of Northern Arizona	Cultural Resources Native American Concerns

LIST OF NMGS SUBSTANTIVE COMMENTERS (continued)

Commenter Identification #	Commenter	Areas of Substantive Comment
234	Susan Rich	Purpose and Need Air Quality
242	BIA - Shiprock	Hydrology
244	BIA - Shiprock	Hydrology Threatened and Endangered Species Vegetation Wildlife
247	Mrs. Lorraine Hartshorne (Mesilla Valley Audobon Society)	Procedural Native American Concerns
250	Dixon Community Forum	Alternatives
251	Colorado State Engineer	Hydrology
252	Corps Engineers	Proposed Action Hydrology Wildlife
253	Irene Gilbert	Purpose and Need Hydrology
254	Craig Thompson	Purpose and Need Air Quality Hydrology Native American Concerns Possible New Town
258	Dr. Frank D. Gilland	Purpose and Need Alternatives
264	Kyle MacDonald	Air Quality Cultural Resources
266	New Mexico State Parks and Recreation Department	Purpose and Need Alternatives Air Quality Hydrology Social and Economic Conditions

LIST OF NMGS SUBSTANTIVE COMMENTERS (continued)

Commenter Identification #	Commenter	Areas of Substantive Comment
269	Jicarilla Apache Tribe	Environmental Consequences Air Quality Hydrology Social and Economic Conditions Threatened and Endangered Species Transportation
271	Sy Baldwin	Purpose and Need
273	Committee on Coal	Purpose and Need
289	Notes from Informal Surface Owner Consultation Meetings	Proposed Action Procedural Hydrology Possible New Town
291	Notes from Informal Surface Owner Consultation Meetings	Land Use Controls and Constraints
292	Notes from Informal Surface Owner Consultation Meetings	Proposed Action
293	Notes from Informal Surface Owner Consultation Meetings	Proposed Ute Mountain Land Exchange
302	M'Lynne Womble Kenney	Hydrology
310	Harry Bishara, M.D.	Native American Concerns
316	Tish A. Steinfeld	Air Quality Hydrology
319	Edward T. Hall	Purpose and Need Cultural Resources
320	Maria Christina Lopez	Air Quality

LIST OF NMGS SUBSTANTIVE COMMENTERS (continued)

Commenter Identification #	Commenter	Areas of Substantive Comment
328	Frank McGuire	Social and Economic Conditions
329	J.R. Kendal	Social and Economic Conditions
331	Bobbe Dyer	Coal
332	Evelyn Saucier	Social and Economic Conditions
333	Lee Norberto	Social and Economic Conditions
340	Dorothy Boynton	Air Quality
343	Mike Williams	Air Quality
346	Nick Lensen	Alternatives Purpose and Need Air Quality Social and Economic Conditions
354	Elaine G. Taylor	Air Quality Hydrology
355	Arizona Archeological Council	Cultural Resources Native American Concerns Possible New Town
356	William V. Turk	Proposed Action
365	Herbert Blatchford	Air Quality Hydrology
371	Lee Norberto	Hydrology
373	Lester Tsosie	Air Quality
374	Jerry Elwood	Procedural Hydrology
374a	Jerry Elwood (Exhibit 1)	Procedural Hydrology

LIST OF NMGS SUBSTANTIVE COMMENTERS (continued)

Commenter Identification #	Commenter	Areas of Substantive Comment
375	Harry Bishara	Native American Concerns
389	Katherine and Abraham Spencer	Native American Concerns Cultural Resources
395	Julia Hoskins	Social and Economic Conditions
396	Hugh P. Maxwell Flora J. Maxwell	Hydrology Native American Concerns Proposed Action Alternatives Purpose and Need
397	Pueblo of Sandia	Native American Concerns
398	New Mexico Citizens for Clean Air and Water	Air Quality
404	Tish M. Steinfield	Cultural Resources Hydrology
409	Trudy Berman	Environmental Consequences Purpose and Need
415	Salt River Project	Proposed Action Affected Environment
416	Alyce Frank	Native American Concerns
420	Larry Frank	Purpose and Need Alternatives Social and Economic Conditions Procedural Environmental Consequences

LIST OF NMGS SUBSTANTIVE COMMENTERS (continued)

Commenter Identification #	Commenter	Areas of Substantive Comment
428	Navajo Health Systems Agency	Proposed Action Hydrology Social and Economic Conditions
431	New Mexico Archeological Council	Environmental Consequences Cultural Resources Social and Economic Conditions Native American Concerns Proposed Action Hydrology
433	U.S. Fish and Wildlife Service	Threatened and Endangered Species Authorizing Actions Proposed Action Alternatives Mitigation Air Quality Hydrology Possible New Town Recreation Resources Vegetation Wildlife
435	Fred S. Hanselman	Auth. Actions Alternatives
437	Randy Albright	Alternatives Coal Hydrology Social and Economic Conditions Visual Resources
438	Americans for Rational Energy Alternatives	Alternatives Mitigation Cultural Resources Native American Concerns Social and Economic Conditions

LIST OF NMGS SUBSTANTIVE COMMENTERS (continued)

Commenter Identification #	Commenter	Areas of Substantive Comment
441	Western Network	Hydrology
442	Alice M. DuFaux	Environmental Consequences
444	Navajo Nation	Purpose and Need Alternatives Environmental Consequences Mitigation Procedural Air Quality Cultural Resources Hydrology Land Use Controls and Constraints Native American Concerns Social and Economic Conditions Threatened and Endangered Species Transportation Visual Resources
445	Division of Conservation Archeology	Cultural Resources
449	Arizona Archeological Council	Cultural Resources Native American Concerns Social and Economic Conditions
450	DNA - People's Legal Services, Inc.	Procedural Social and Economic Conditions
451	Stephen LeCuyer	Purpose and Need Alternatives Procedural Native American Concerns Social and Economic Conditions

LIST OF NMGS SUBSTANTIVE COMMENTERS (continued)

Commenter Identification #	Commenter	Areas of Substantive Comment
457	Environmental Defense Fund	Purpose and Need Proposed Action Alternatives Environmental Consequences Mitigation Procedural Purpose and Need Editorial Air Quality Hydrology Land Use Controls and Constraints Mineral Resources Social and Economic Conditions Transportation
458	Friends of the Earth	Procedural Alternatives Purpose and Need Proposed Action Social and Economic Conditions Air Quality Hydrology
461	Dee Homans	Purpose and Need Native American Concerns
462	Jeffrey Henry (ENA)	Native American Concerns
469	Wendy Allen	Cultural Resources Native American Concerns
478	State of New Mexico	Purpose and Need Proposed Action Alternatives Environmental Consequences

LIST OF NMGS SUBSTANTIVE COMMENTERS (continued)

Commenter Identification #	Commenter	Areas of Substantive Comment
478	State of New Mexico (continued)	Procedural Editorial Air Quality Hydrology Possible New Town Paleontology Social and Economic Conditions Vegetation
483	Southwest Research and Information Center	Alternatives Proposed Action Social and Economic Conditions Environmental Consequences
484	Committee on Coal	Purpose and Need Environmental Consequences Procedural Alternatives Hydrology Native American Concerns Land Use Air Quality
490	Sharon P. Murray	Proposed Action Social and Economic Conditions
491	Jonathan Bloomberg	Purpose and Need Air Quality Hydrology
492	Rosalind McClellan	Purpose and Need
496	DNA - People's Legal Services, Inc.	Purpose and Need Procedural Alternatives Cultural Resources Hydrology

LIST OF NMGS SUBSTANTIVE COMMENTERS (continued)

Commenter Identification #	Commenter	Areas of Substantive Comment
496	DNA - People's Legal Services, Inc. (continued)	Possible New Town Native American Concerns Transportation Reclamation Editorial Air Quality Environmental Consequences Mitigation Procedural
497	Sierra Club Legal Defense Fund	Mitigation Procedural Alternatives Hydrology Air Quality Possible New Town
498	National Park Service	Air Quality Visual Resources Environmental Consequences Cultural Resources Mitigation Alternatives Land Use Controls and Constraints Recreation Editorial Social and Economic Conditions
503	USFWS	Threatened and Endangered Species
505	Bureau of Reclamation	Cultural Resources Hydrology Threatened and Endangered Species Proposed Action
509	Navajo-Hopi Indian Relocation Committee	Procedural Native American Concerns

LIST OF NMGS SUBSTANTIVE COMMENTERS (concluded)

Commenter Identification #	Commenter	Areas of Substantive Comment
511	Navajo Nation - Department of Justice	Procedural Hydrology
519	BIA - Albuquerque Area Office	Alternatives Hydrology
523	Bureau of Reclamation	Hydrology
526	Rosalind McClellan	Purpose and Need
532	Office of Surface Mining	Air Quality Hydrology Social and Economic Conditions Vegetation Wildlife
533	BIA - Albuquerque Area Office	Hydrology
534	Danny Charlie's Notes (Informal Surface Owner Consultation Meeting)	Cultural Resources Native American Concerns
536	New Mexico Department of Game and Fish	Threatened and Endangered Species Wildlife

COMMENTS AND RESPONSES

The following section contains all substantive comments made on the NMGS DEIS and BLM's responses to those comments.

Identical or similar comments have been grouped and summarized where possible. Those who made the comments are indicated by their sequential identifying number which can be cross-referenced to the preceding list. A companion volume contains selected comment letters received and the Final Cumulative Overview.

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Air Quality

Comment. Even though the increased pollutant concentrations are projected to not exceed the New Mexico and federal ambient air quality standards, there still may be a possibility for effects on forest, range, livestock and wildlife resources. The impacts on health and vegetation are not discussed with respect to these increased concentrations. (17, 118, 131, 162, 163, 169, 178, 193, 244, 269, 320, 343, 346, 365, 398, 484, 532, 534.)

Response. The effect of SO_2 and NO_x emissions on vegetation is discussed in the Vegetation TR (pp. 4-4 through 4-7). It is concluded in the TR that no pollution-caused changes in the composition or production of native communities of plant species around NMGS are expected within 10 years.

The potential effects of SO_2 on wildlife may be indirect or direct. Indirect effects may result from impacts to vegetation used for food and cover. Direct effects may involve physiological and pathological changes in the animals as a result of exposure to SO_2 concentrations. Studies of cattle fed vegetation with more than 25 percent SO_2 leaf damage demonstrated no significant effect on the cattle (Lillie 1970). In experiments with mice and guinea pigs, no mortality occurred after 47 days of continuous fumigation with 66,286 ug/m^3 SO_2, nor did any abnormal symptoms develop during 30 days of continuous exposure of guinea pigs to 28,034 ug/m^3 of SO_2. In addition, guinea pigs, rabbits, and rats continuously exposed to 26,000 ug/m^3 of SO_2 for 90 days showed normal physiological development (Setterstrom 1940).

The concentrations resulting from operation of NMGS would be below the levels reported by Lillie (1970) or Setterstrom (1940) by 2 orders of magnitude. Thus, the SO_2 concentrations resulting from operation of NMGS would not be expected to adversely affect wildlife or livestock.

Reports of NO_2 poisoning of animals in the field exist only in situations where animals near farm silos were exposed to very high concentrations (216,000 ug/m^3 or greater) in the silos (Lillie 1970). Laboratory results have shown that continuous exposure of NO_2 for 90 days at 13,100 ug/m^3 resulted in the following mortality of exposed test animals: rats, 18 percent; rabbits, 66 percent; mice, 13 percent. However, intermittent exposure for 18 months at 9400 or 4700 ug/m^3 resulted in no mortality and no significant difference in body weight or effects to physiological functions (Stokinger and Coffin 1968). Since the maximum expected concentrations of NO_2 are projected to be below these levels by 2 to 3 levels of magnitude, operation of the proposed NMGS would not be expected to have any effect on domestic animals or wildlife.

Synergistic Effect of Sulfur Dioxide and Nitrogen Dioxide. Vegetation injury has been shown to occur at lower threshold concentrations when SO_2, NO_2, and/or ozone are combined than when they are segregated (EPA 1973b, Tingey et al. 1971, Dochinger et al. 1971). Studies by Tingey et al. (1971) indicated that plant injury will occur after 4-hour exposures, when NO_2 and SO_2 are mixed at levels of 94 to 470 ug/m^3 NO_2 and 131 to 655 ug/m^3 SO_2. At concentration levels of 188 ug/m^3 NO_2 and 262 ug/m^3 SO_2 for a 4-hour exposure period, Tingey et al. (1971) reported up to 35 percent severe leaf injury for tomatoes, tobacco, oats, radishes, soybeans, and pinto beans. However, Hill et al. (1974) found no damage from SO_2 and NO_2 synergism to vegetation from 2-hour fumigation exposures with levels of NO_2 ranging from 188 to 9400 ug/m^3 and SO_2 ranging from 1310 to 28,820 ug/m^3.

Several conditions (i.e., proper environmental conditions causing plant susceptibility, NO_2 and SO_2 concentrations high at the same location and time, and concentrations remaining high for an extended period of time) would be necessary to develop the potential for plant injury caused by the synergistic effects of NO_2 and SO_2. Since the likelihood of occurrence of high SO_2 and high NO_2 levels is low, the joint frequency of occurrence must also be low. Consequently, simultaneous occurrence of the factors necessary for synergistic effects to occur as a result of NMGS would be unlikely.

Human Health Effects. Air quality standards establish the estimated levels of certain pollutants at which public health effects would not occur, allowing for an adequate margin of safety. Therefore, it has been assumed that if the proposed project does not cause concentrations to exceed the New Mexico and federal ambient air quality standards, public health effects would not be expected to occur. The procedure used to establish air quality standards to protect public health is as follows:

Ambient air quality standards are established by the U.S. EPA through a detailed procedure stipulated in the Clean Air Act (Title I, Part A, Sections 108 and 109). The procedure requires a review to be conducted by a seven-member independent committee composed of at least one member of the National Academy of Sciences, one physician, and one person representing state air pollution control agencies. The committee is called the Clean Air Scientific Advisory Committee (CASAC). The CASAC studies are used by the EPA as a basis for selecting standards that minimize the risk of adverse effects on public health and welfare. The EPA is thus required to set national primary air quality standards to protect against pollution levels that "endanger public health, allowing an adequate margin of safety."

In establishing the primary (health) standards, the U.S. EPA recognizes that it is impossible to provide a sharp dividing line between air in which detrimental effects will never occur, and air in which they may occur. However, the risk assessment used to establish air quality standards provides an indication of air pollutant levels associated with low or minimal probabilities of occurrences of adverse events in population. The primary (health) standards are then established at levels lower than those associated with the minimal risk, in order to ensure the adequate margin of safety stipulated in the Clean Air Act.

Comment. A number of comments expressed concern that the DEIS did not adequately discuss the impact acid rain would have on vegetation and archaeological ruins. (269, 346, 354, 409, 491.)

Response. As discussed on DEIS p. 3-6 and in the Air Quality TR, the potential increase in acid precipitation due to NMGS alone cannot be quantified. Thus the impact to vegetation and ruins cannot be quantified. The San Juan Basin has moderate to strongly alkaline soils that should serve to neutralize some of the precipitation acidity.

Comment. Comments on visibility/regional haze issues generally centered on two areas: (1) the need to address National Park Service (NPS) concerns on impacts to parks in the region, and (2) the need to assess the increase in large-scale visibility reduction. Several commenters expressed concern that visibility in the project region has been decreasing in recent years and that the proposed project would add to this deterioration. (17, 168, 229, 234, 269, 346, 418, 458, 484, 497.)

Response. The impact of a pollutant plume from the proposed NMGS (i.e., plume blight) was assessed with the PLUVUE model developed by Systems Applications Inc. (SAI). This model and the modeling results are presented in more detail in the Air Quality TR. Model simulations were conducted for observer locations in CCNHP, Mesa Verde, and San Pedro Parks. Studies by SAI have shown the PLUVUE model to overpredict plume impacts.

The modeling approach and results were discussed with NPS staff during a meeting held at the NPS Santa Fe, New Mexico office on July 22, 1982.

Regional haze may be considered as a widespread, regionally homogeneous impairment to visibility that results from a multitude of sources. Visibility in the Four Corners area is currently excellent according to a National Commission on Air Quality (NCAQ) study (NCAQ 1981). The NCAQ estimates the area to have an annual average visual range of 80 miles and the NPS reports median visibilities of 120 miles or greater at CCNHP (NPS 1981). However, a number of commenters expressed a belief that visibility impairment has increased in recent years.

Although the NPS has conducted such studies, there is not an EPA approved model

to quantitatively assess the contribution of a single source (such as NMGS) to regional haze levels. The NMGS would emit pollutants that would contribute to regional haze. However, the NCAQ has projected (assuming no change in the current regulatory policy) that the Four Corners area median visibility levels will remain approximately the same through the year 1995. This study also estimates that as much as 90 percent of the sulfate affecting the four corners area is transported into the area from other regions.

Comment. Several commenters stated that the discussion of acid rain impacts was too limited and did not provide quantification of expected impacts. Others questioned the statement that there is currently no direct cause and effect relationships between power plant emissions and acid precipitation. (12, 17, 90, 103, 113, 145, 171, 201, 234, 254, 269, 340, 409, 433, 458, 484, 497.)

Response. A detailed analysis of the acid precipitation issue is provided in Section 4.9 of the Air Quality TR. This analysis defines acid precipitation as precipitation having a pH of 5.6 which would be expected from the dissolution of atmospheric carbon dioxide in water. Measurements of acid precipitation, summarized in the TR, have shown precipitation pH in the eastern United States to average from 4 to 4.5. Baseline measurements taken at Bandelier National Monument as part of the National Acidic Deposition Program (NADP) range from a pH of 4.1 to a pH of 6.2.

Acid precipitation is widely recognized, although not universally accepted, as being related to precursor emissions from the combustion of fossil fuels. Thus, power plant emissions are suspected of playing a role in acidification. However, the role of natural precursor sources and the mechanisms of long-range atmospheric transport and chemical transformation are not well known at this time. Because of these uncertainties, the impact of a single source such as the proposed NMGS cannot be quantified at this time.

Based on project emission levels, NMGS would contribute 3 percent of anthropogenic SO_x and NO_x emissions for a three-state (New Mexico, Utah, and Colorado) area in the year 2000. Thus, NMGS would contribute to atmospheric loading of acid precipitation precursors. However, this contribution to the formation of acidic precipitation cannot be quantified.

Wind data indicate that the NMGS emissions would be transported from west to east. However, the long-range transport of these materials with respect to acidic precipitation formation cannot currently be quantified.

With respect to the comments regarding the DEIS statement on p. 3-1 which reads: "Currently there are no cause-and-effect relationships between coal-fired power plant emissions and acid precipitation effects," changes have been made to the FEIS Text.

Comment. Several commenters expressed concern that there is no discussion of how NMGS would be made less polluting. They maintain that the only control technologies examined are those that result in 85 percent reduction of SO_2 and 30 percent reduction of NO_x. One commenter mentioned that there are plants for which 95 percent SO_2 and 80 percent NO_x reductions have been achieved. Related to this, some commenters felt that the EIS should specify methods or technologies to make the NMGS the "least polluting possible." (24, 133[a], 266, 457, 458, 478, 484.)

Response. The final selection of control technologies to be used for NMGS was not yet made at the time of preparation of the DEIS, and is so stated in the DEIS and Air Quality TR. The final selection would depend on several factors, including advances in control technology, and the requirement for the use of Best Available Control Technology (BACT) by the EPA, Region VI and the Environmental Improvement Division (NMEID). With respect to the BACT requirement, the Prevention of Significant Deterioration (PSD) permit review process provides that each major source of air pollution applies the "best" control technology, considering technical, environmental, energy, and economic factors. BACT is determined for each project on a case-by-case basis and must, at a minimum, meet the applicable

emission limitations of the EPA and NMEID. As discussed in the Air Quality TR, the emission limitations of both agencies would be met.

Since BACT is determined on a case-by-case basis, it may vary with time as new technologies emerge and are commercially proven. Thus, it would be inappropriate for this EIS to specify control technologies as BACT prior to the PSD review process.

NEPA specifies that where necessary information is missing (such as control efficiencies needed to estimate pollutant emissions), a "worst-case" analysis must be performed. This was done in the DEIS by using the lowest control efficiencies of the alternatives being considered, thus maximizing pollutant emissions for purposes of conducting the air quality impact analyses.

These emission levels were input to the dispersion modeling analyses; thus, predictions of concentration increases also represent conservative scenarios. Actual emissions (and the subsequent concentration increases), are therefore expected to be less than or equal to those levels presented in the DEIS.

Comment. A concern was raised that Baselines 1 and 2, rather than being based on "some projection of future development" are based on extrapolations of development that "...industry would like to see." (165, 474, 496.)

Response. A detailed account of how the future air quality was calculated is contained in the Air Quality TR, Sections 2.7, 2.8, and 3.4. (Also see Appendix C which describes Baselines 1 & 2.) As described in these sections, information on proposed projects, and expected levels of operation were obtained from a variety of sources including PNM, NMEID, and the EPA, Region VI. Projected levels of emissions from Four Corners, San Juan, and Prewitt-Escalante Generating Stations were based on emission limitations that are administered and enforced by the NMEID, in conjunction with the expected additional development of these sources. This expected increase in development is on record with NMEID.

The Air Quality TR points out that these power plants are the major sources of SO_2 and NO_x in the San Juan Basin; as such, projected changes at these sources are responsible indicators of changes in emissions in this region for the time period in which NMGS would come on line. Information pertaining to changes in emissions at minor sources of emissions is currently not available from the various environmental agencies.

The other sources of emissions are categorized as area sources, which include residences and automobile and other vehicular emissions. The increase in these emission sources was prorated as a function of population increases estimated for the San Juan Basin.

Comment. Some commenters expressed concern that the maximum concentration increase projected for NMGS would occur approximately midway between the proposed plant and the CCNHP. Their questions addressed the possible air pollution effects within the park with respect to projected concentration increases. (229, 264, 457, 458, 484, 498.)

Response. Pollutant concentrations were projected to be below all applicable New Mexico and federal ambient air quality standards. These standards are established to protect the public health and welfare of the United States with an adequate margin of safety. A comment raised previously addressed possible health and vegetation effects of pollutants, even if such standards are not exceeded. The response stated that it is not expected that adverse health, vegetation, or wildlife effects would occur as a result of increased pollutant concentrations associated with NMGS. This statement was made with respect to the "maximum" concentrations projected due to the project. Thus, the statement is applicable to all areas, including CCNHP.

Comment. One commenter expressed concern over NGMS's contribution of particulate matter in situations during which the TSP standards may be exceeded due to low level dust. Another comment stated that particulate emissions from NMGS and the associated mine would cause the New Mexico

and federal ambient air quality standards for particulate matter to be exceeded. (316, 343, 398, 474, 484.)

Response. As stated in the Air Quality TR, occurrences of TSP concentrations in excess of the standards have been measured at various monitoring stations in the San Juan Basin. However, both the EPA, Region VI, and the NMEID recognize that such excursions over the standards are due primarily to naturally occurring fugitive or low-level dust. For this reason, the region has remained classified as "attainment" of the standards for particulate matter.

High levels due to naturally occurring fugitive dust have been measured but, as stated in the Air Quality TR, the annual average of particulate matter was used as a better representation of the 24-hour concentrations. This was done upon the recommendation of the U.S. EPA in its fugitive dust policy (EPA 1977a, b) which states:

> New sources that wish to construct in rural areas should be allowed to do so without the need of an emission offset if they meet certain criteria. These include compliance with specific emissions limitations and the assurance that the source's emissions, plus nonurban background and the emissions from other stationary sources in the vicinity of the proposed location, would not cause violations of the national ambient air quality standards (EPA 1977a).

The modeling analysis demonstrated that the contribution of particulate matter concentrations from NMGS, the associated mine (termed the "hypothetical" mine in the DEIS and Air Quality TR), Four Corners, San Juan, and Prewitt-Escalante Generating Stations, would not cause the New Mexico nor the federal ambient air quality standards to be exceeded.

Comment. The significance criteria for air quality are based on New Mexico and federal ambient air quality standards. Several commenters expressed concern that these standards are not adequate to assess impacts. Some comments were made that PSD increments should have been used as significance criteria and that an increment analysis should have been conducted. (343, 398, 457, 474, 484, 496, 498, 532.)

Response. The Air Quality TR's Framework for Analysis (Section 2.0) provides an explanation of why ambient air quality standards, rather than PSD increments, were used as indicators for significance. Briefly, the Framework for Analysis states that the analyses conducted were not designed to determine whether EPA's or NMEID's permitting requirements have been fulfilled, since such analyses are specific to the requirements of PSD review.

However, one commenter stated that "significant" impacts may occur even if ambient concentrations do not exceed the standards. A previous response to comments has addressed the issue of impacts upon vegetation, wildlife, and human health. That response discusses possible effects on vegetation and wildlife as a function of pollutant concentrations. The response concludes that no adverse effects on vegetation and wildlife would be expected to occur as a result of increased pollutants. It is important to note that this conclusion is based upon the projected ambient concentrations and that such concentrations are not projected to exceed the ambient standards.

It is doubtful that an increment analysis such as that required under the PSD regulations would shed any additional light on these issues. The increment limits must be shown not to be exceeded in order to obtain a PSD permit. As stated in the Air Quality TR, the granting of a ROW by BLM does not prevent the EPA and the State of New Mexico from denying issuance of a PSD permit if the increment consumption demonstration cannot be made.

Further, the legislative history of the Clean Air Act indicates that the PSD increment limits were intended as benchmarks to be used by the EPA in their decision-making process. As such, these limits are tools related to permitting, siting, and area classification issues. They are not absolute limitations on the deterioration of air

quality, nor are they equivalent to supplementary air quality standards (National Research Council 1981).

With respect to the future permitting, siting, and area classification issues mentioned above, the National Commission on Air Quality (NCAQ) examined the issue of increment consumption in the Four Corners region, and presented the results in its Report to Congress (NCAQ 1981). The study assessed the impact of the PSD program on regional energy growth in this region, and assumed a tripling of current electric generating capacity, as well as a 400 percent increase in current coal production, among other conservative scenarios. It was concluded that increment limits do not appear to present significant constraints for this level of development. The effect of these limits, rather than to prevent such development, is to make the siting of such projects somewhat more difficult than if no increment limits were in effect, and would perhaps result in increased requirements for control of emissions of sulfur oxides (NCAQ 1981).

It is doubtful that an increment analysis would provide any meaningful information other than computing a "number" that represents increment consumption. The amount of increment consumed in an area is a function of the emissions of certain "increment-consuming" sources. However, not all sources of air pollution consume increment. For legal and regulatory reasons, major sources of pollutants that have been constructed prior to January 6, 1975, are defined in the PSD regulations as contributing to "baseline concentrations," rather than consuming increment.

Applying this aspect of PSD to one of the major emission sources in the project region - the Four Corners Power Plant -- only a portion of the total emissions from Four Corners would be considered to consume increment. Thus, the status of increment consumption does not necessarily reflect changes in ambient air quality. (The portion which consumes the increment are the emission changes that have occurred after January 6, 1975, due to modifications made at the plant.)

As the above example indicates, the concept of "increment consumption" is abstract and has meaning within the specific legal requirements of the PSD regulations, but does not directly address the issue raised in public scoping meetings; i.e., the "overall lowering of air quality." In predicting total future concentration levels, the analysis for this EIS considered total emissions from Four Corners and San Juan Generating Stations, in combination with NMGS. A PSD increment analysis would only consider portions of emissions from these two existing power plants.

The method of addressing total emissions provides a logical means of assessing the overall change in air quality rather than providing a "number" which has meaning within the requirements of a regulation that (as has been shown) will not necessarily limit development in the Four Corners region.

Comment. The meteorological impact to the models is inappropriate and not adequately explained. In particular, 60-meter wind data reflect drainage flows not representative of conditions at plume height. (343, 398.)

Response. The input to the dispersion modeling analysis is discussed in the Air Quality TR and reports prepared by Environmental Research and Technology (ERT), referenced in the DEIS and TR. The 60-meter meteorological data were judged to be the most representative data available. An analysis of the meteorological data by ERT concludes that low to medium wind speed conditions from the south-southeast and southeast directions are due to the drainage flow. A wind rose of these data indicates that wind speeds less than 6 knots from these directions occur only about 6 percent of the time on an annual average. No data are available to assess how these conditions might differ from those at plume height.

Comment. There is no justification for stating that the SAI visibility model (PLUVUE) produces conservative results. (343.)

Response. As discussed in the Air Quality TR (p. 2-11), the SAI PLUVUE model has been

evaluated using field measurements collected during the EPA-sponsored VISTTA program. This study found the model to overestimate the visual impact of plumes.

Comment. The modeling for the mine in the DEIS uses different meteorological assumptions than in the Cumulative Overview. (343, 398.)

For the Cumulative Overview annual concentration modeling, the meteorological data were taken from STAR data compiled for Winslow, Arizona. It is noted that these data are different from data used for NMGS which were based on meteorological data compiled at the NMGS monitoring station. The general wind patterns for Winslow are similar to those measured at NMGS.

Comment. The use of sector averaging is inappropriate for modeling of fugitive dust emission from strip mining. (343, 398.)

Response. The sector-averaging approach is commonly used in dispersion modeling of area sources. Emission of fugitive dust from surface mining would originate from a large area. It is reasonable to assume that these emissions would be spread over a large area as they move downwind.

Comment. What will be the health impacts due to mercury and lead emissions? (365, 474.)

Response. The lead and mercury content of the coal is such that concentrations of these substances due to combustion of this coal would be negligible. Specifically, the emissions of lead are estimated to be 2.6 lbs/hr, which is 0.4 percent of the total particulate matter emissions associated with NGMS (656 lb/hr). Mercury emissions would be 0.6 lb/hr based on a maximum mercury content of 0.22 ppm by weight in the coal. The maximum concentration increase of particulate matter due to NMGS alone is projected to be 5.7 ug/m^3. Concentration increases of lead and mercury can thus be estimated by calculating the ratios of lead and mercury emission respectively to total particulate matter emissions and multiplying by the 5.7 ug/m^3 maximum TSP value. The 24-hour maximum lead and mercury concentration increases derived in this manner are 0.02 ug/m^3 and 0.005 ug/m^3, respectively.

The national ambient air quality standard for lead is 1.5 ug/m^3 (3-month average). As shown above, the projected 24-hour maximum increase is an order of magnitude below the federal 3-month standard for lead. It is not expected that this increase in lead concentration would present a health hazard.

Although there is no ambient air quality standard for mercury, the American Conference of Governmental Industrial Hygienists (ACGIH) has established a Threshold Limit Value (TLV) for mercury of 50 ug/m^3 (24-hour basis). This level represents an indoor standard for workers which is quoted here for comparison purposes. The ACGIH believes that nearly all workers may be repeatedly exposed this level day after day without adverse effects. Since the concentration increase for mercury is four orders of magnitude below this level, it is not expected that the increase in mercury concentration would present a health hazard.

Comment. The values of particulate matter concentrations differ by 20 percent between Table 2-1 and 2-2, and Tables 2-3 and 2-4. What is the reason for this difference? (457.)

Response. Tables 2-1 and 2-2 compare the average of maximum concentrations observed in the San Juan River Valley with the New Mexico and federal ambient air quality standards, respectively. Similarly, Tables 2-3 and 2-4 compare the maximum concentrations observed at the project site with these respective standards. Under New Mexico Environmental Improvement Board regulations, concentrations of air pollutants are reported at ambient conditions. Footnote "a" in Tables 2-1 and 2-3 defines the ambient presence to be 633 mm of mercury, and the ambient temperature to be 25°C. The federal standards are reported in terms of "standard" temperature and pressure, i.e., 760 mm mercury and 25°C (see footnote "a" in Tables 2-2 and 2-4). The values presented in Tables 2-2 and 2-4 for particulate matter were obtained by multiplying the values in DEIS Tables 2-1 and 2-3 by the ratio of "standard" pressure to ambient pressure; i.e.,

760/633, or 1.2. This accounts for the 20 percent difference in values between the two sets of tables.

Comment. No description of the dispersion or input assumptions or model are discussed on DEIS pp. 3-1 to 3-8. (484, 532.)

Response. The modeling approach and input was summarized in the DEIS and discussed in detail in the Air Quality TR.

Comment. The height on NMGS's stacks would cause pollutants to be dispersed over a wide area, thus contributing to acid rain. (497.)

Response. The height on NMGS's stacks were derived, in part, by using the EPA procedure to determine what is termed Good Engineering Practice (GEP) stack height. This height ensures that high concentrations due to stack downwash and eddy effects would not occur.

With respect to the relationship between stack height and the formation of acidic precipitation, this is not yet fully understood; thus, it cannot be said with certainty that the height of the proposed NMGS stacks are a major factor in any acidic precipitation that may occur.

Comment. Visibility discussion should also address reductions in visual range, color, and contrast in addition to plume perceptibility. The negative aspects on visitor experience at CCNHP should be discussed. (269, 498.)

Response. The modeling analysis conducted by SAI included projections of reductions in visual range and contrast, as well as plume perceptibility. It should be pointed out, however, that such numbers refer to reductions in visual range and contrast as viewed through the plume rather than any overall reduction due to regional haze. Thus, inclusion of these values was judged to cause confusion and misinterpretation. Reference is made to the SAI study that was conducted, and the values of visual range reduction and contrast reduction are included in the SAI report which is available to the public. Reference is also made to a discussion of plume effects on visual quality in the Visual Resources TR (pp. 4-3 and 4-4). Since plumes are assessed to be visible from CCNHP vantage points approximately 3 percent of the year (and primarily during non-peak visitor seasons) these would not represent significant impacts. The chart referenced by the commenter includes the number of mornings and afternoons that plumes of varying degrees of perceptibility would occur. An evaluation was made in the TR that concluded that the frequency of visible plumes is projected to be low. An explanation is included on p. 4-59 of the TR regarding the fact that there are currently no existing numerical standards specifying visual impairment.

Comment. The ambient air quality for TSP is not a good indicator of visibility impairment, since impairment occurs at levels below the standard. (399.)

Response. The ambient standards were not used as indicators of significance for visibility impacts. These impacts were assessed using model estimates of plume perceptibility, as discussed on p. 4-54 of the Air Quality TR.

Comment. The average visual range at Bandolier and CCNHP are greater than those presented in the DEIS. (498.)

Response. The data presented in the DEIS were taken from a 1981 National Park Service report entitled "Report for Target 6 Chaco Canyon National Cultural Park," and have been added to Chapter 2.

Comment. One commenter expressed concern over the possible health effects that radionuclides released during combustion of coal would have. (131, 437.)

Response. The amount of radionuclides that could potentially be released during combustion of coal was explored in detail in the Air Quality TR (see Section 47.1 of the TR). The analysis conducted shows that the release of radioactive material from NMGS would be below the radiation protection guides set forth in the Code of Federal Regulations (10 CFR 20). Specifically, the total concentration of radionuclides is projected to be below 0.009 percent of the

Nuclear Regulatory Commission standard at the point of maximum impact (8 miles southeast of NMGS). The increase in concentration is a negligible fraction of typical baseline levels that occur in the San Juan Basin, as discussed on p. 3-23 of the Air Quality TR. Thus the likelihood of any health effects from NMGS coal combustion would be very small.

Comment. What would be the effects of acid rain due to NMGS on plants, endangered species, soil, and archeological sites? (103, 145, 346, 373, 491, 496.)

Response. The subject of this question has been addressed separately in the following TRs: Wildlife, Threatened and Endangered Species, Vegetation, and Paleontology. However, the subject is treated in a qualitative fashion because there are currently no accepted methods by which quantitative predictions of acidic precipitation formation due to a particular emission source can be computed. A discussion of acid rain and NMGS impacts is presented in Section 4.9 of the Air Quality TR.

Comment. Why is a three-state projection used for total NO_x and SO_2 emissions? What is the contribution from New Mexico alone? (498.)

Response. The three states of Colorado, New Mexico and Utah were chosen from a compilation of emission projections made by the EPA (1979) for six western states: Colorado, New Mexico, Utah, Wyoming, Montana, and North Dakota. Of these states, the first three were judged to be the most likely to contribute emissions of SO_2 and NO_x to any possible acidic precipitation that may occur. As discussed in the Air Quality TR, acidic precipitation is believed to occur over distance; thus, it is likely that such formation would include emissions not only from New Mexico, but from other neighboring states as well. For this reason, the contribution from New Mexico alone was not considered.

The TR mentions that NO_x and SO_2 emissions from regions as far away as the west coast of California could contribute to the formation of acidic precipitation in the high mountain lake areas of Colorado. If these emissions had been included, as well as other southwestern states such as Nevada and Arizona, the NMGS contribution would have been much less than 3 percent. Thus, the use of a three-state area is conservative for purposes of assessing the potential contribution of NMGS to the possibility of acidic precipitation in other regions.

Comment. The EIS ignored the acid rain baseline research performed by Dr. Harte of the University of California, and others. (254, 457.)

Response. The Air Quality TR (Section 4.9) contains a comprehensive summary of information available in the literature pertaining to baseline levels of acidic precipitation recorded in the Southwest United States. Every effort was made to use the most current and pertinent information available. A discussion with Dr. Harte confirmed that the types of preliminary findings of his work are represented in the range of literature reviewed and synthesized for this EIS.

Comment. A different modeling approach for low-terrain areas is recommended, specifically a tall stack model developed by Martin Marietta Company. (343, 398.)

Response. The Multiple Point Terrain model (MPTER) was used for the low terrain modeling. This model has been reviewed and approved by the U.S. EPA and was considered appropriate to simulate the effect of emissions from the power plant stacks in low terrain areas. The modeling analyses for the DEIS were completed prior to the Martin Marietta model being published.

Comment. The EIS incorrectly finds that the impact of acid rain would be insignificant. (229, 316, 346.)

Response. The EIS does not find that the impact of acid rain from NMGS emissions would be insignificant. Although the impact cannot be quantified at this time, the potential for some impact from NMGS exists, as was stated on DEIS p. 3-6.

As noted on pp. 4-71 through 4-79 of the Air Quality TR, acid precipitation is caused

by the emission into the atmosphere of precursor compounds such as sulfur dioxide and nitrogen oxides. Evidence indicates that these emissions may be transported for long distances prior to being transformed into acid precipitation. Based on EPA projections, NMGS would contribute approximately 3 percent of the total energy related anthropogenic SO_2 and NO_x emissions in a three state region (New Mexico, Utah, and Colorado) in the year 2000. It is possible, however, that emissions from as far away as the West Coast could contribute to acid precipitation. The TR mentions that NO_x and SO_2 emissions from regions as far away as the west coast of California could contribute to the formation of acid precipitation in the high mountain lake areas of Colorado. If these emissions had been included, as well as other southwestern states such as Nevada and Arizona, the NMGS contribution would have been much less than 3 percent. Thus, the use of a three-state area is conservative for purposes of assessing the potential contribution of NMGS to acid precipitation.

Comment. The air monitors, including PNM's monitor at the proposed site, do not present a representative picture of the effects of air pollution under certain wind conditions. In particular, the location of the monitor at the NMGS site would not adequately represent the concentrations from the existing power plants. (26, 60.)

Response. The extensive monitoring system in the San Juan Basin was designed cooperatively by Arizona Public Service Company, Public Service Company of New Mexico and the NMEID. As shown on Figure 3-3 of the Air Quality TR, the monitor network covers not only the area of the existing power plants but the proposed project region as well. Monitors in the area of the existing plants are located both upwind and downwind of the plants. The purpose of the network is to adequately quantify air quality conditions in the San Juan Basin. The NMEID has reviewed the monitoring network and has determined that it is adequate to satisfy the requirements of NMEID Regulation 602.

Comment. The distances of NMGS to Bisti and De-na-zin WSAs stated on pp. 2-18 and 2-22 of the DEIS are inaccurate. The NMGS stacks are closer to these areas than is stated in the referenced pages, and the distances cited are inconsistent with those stated on page S-7 of the DEIS. (457.)

Response. The cited pages in the DEIS provide a general description of the locations of the WSAs with respect to the proposed NMGS. The distances cited on p. S-7 relate to the closest point of the WSA to the generating station itself. The results of the air quality modeling analysis are not dependent on the distances cited on pp. 2-18 and 2-22 of the DEIS. The modeling analysis was based on UTM coordinates of the NMGS stacks, and a receptor grid that encompasses the WSAs includes emissions not only from New Mexico, but from other neighboring states as well. For this reason, the contribution from New Mexico alone was not considered.

Comment. The EIS neglects to acknowledge the various sources of radionuclides that are noted to constitute environmental impacts only if they are released to the environment, and thus causing radiation exposure to the public.

The EIS does not note that these radiation exposures have been extensively measured and are found to be somewhere between trivial and negligible; no more, in fact, than radiation releases from a coal fired plant. (169.)

Response. It is difficult to understand the precise meaning of this comment. In the context of the other comments made by the commenter, it appears that he is saying that the power plant should have a negligible impact with respect to radionuclides and that the EIS is saying that the effect will be significant. If this is the case, we would agree with the commenter that the effect of radionuclides would be small, and that the FEIS so states this to be the case.

Comment. New Town will be downwind of the power plant and thus subject to concentrations of particulate matter. (131[a].)

Response. The modeling analysis conducted for NMGS (discussed in the TR) indicates that at the New Town location, the concentration

increases of TSP due to NMGS stacks are small (less than 5 ug/m^3).

Comment. There has been no previous testing of the SAI visibility model at the distances used in the EIS for NMGS. As such, it appears that extrapolation of this model is probably not very accurate, given that there have been sightings of brown power plant plumes at distances of 100 km. (343.)

Response. The results of the SAI modeling do not dispute the fact that plumes may be visible at 100 km. However, plume perceptibility at these distances are projected to be infrequent, as discussed in the Air Quality TR, and the document prepared by SAI.

The NPS has reviewed the visibility modeling and at meetings with BLM and Woodward-Clyde Consultants has concurred with the approach used for assessing the impacts on visibility with respect to plume perceptibility.

Comment. The use of sector averaging in RTDM and Complex I is inappropriate. The MPTER model used for low-terrain modeling is also inappropriate. (343.)

Response. The use of sector averaging in modeling is a commonly accepted technique. The models assume that an input meteorological condition persists for an entire hour. In reality, the wind meander over a one-hour period may be significant, thus spreading emissions over a large area. The horizontal spread of pollutants also increases with distance from the source. The use of sector averaging accounts for the nonsteady nature of the wind flow. RTDM was applied to high-terrain areas located at significant distances from the source.

Modeling for low-terrain areas near the proposed NMGS used the EPA MPTER model, which does not utilize sector averaging. MPTER characterizes stability using the Pasquill-Gifford method and assumes full reflection of the plume at the base of a stable layer. The commenter noted that an alternate stability method has been developed; however, this technique was not available at the time of our work. The Pasquill-Gifford method is commonly used in dispersion modeling. The assumption of full plume reflection at the base of a stable layer may result in underpredictions when the plume height is greater than the mixing height and the plume is assumed to be embedded in the layer above the mixing height. In cases where the plume height is less than the mixing height, full reflection at the base of the stable layer is assumed, as opposed to partial penetration into the layer. This will result in conservative predictions for these cases.

Comment. The RTDM model with 35 percent plume override should not be used since the NCAQ panel on atmospheric dispersion has rejected it. Specifically, Dr. Bruce Egan of ERT agreed that the 35 percent figure was not accurate. (343, 484.)

Response. The RTDM model is an appropriate model for this application. An EPA-sponsored model validation study is currently being performed by ERT Consultants. According to ERT, all results to date are consistent with the use of RTDM for NMGS. The RTDM model has also been compared to monitoring data in northwest New Mexico, and the comparison showed that RTDM is applicable to conditions in the project area.

The use of the 35 percent plume override is consistent with the NCAQ panel joint position on this matter. As discussed on pp. 7 and 8 of the NCAQ study,

> The National Commission on Air Quality (NCAQ) dispersion modeling panel has determined how some of the important questions should be dealt with in the Four Corners Study. Specifically, for low Froude numbers..., the flow is assumed to pass around an obstacle rather than rising above it. Low Froude numbers are associated with stable conditions and high terrain heights. The panel did not give further guidance on the plume height behavior to be assumed when Fr >0.3 or when the terrain is very rough.

Dr. Bruce Egan of ERT recalls discussing the plume override with the commenter. He does

not recall any specific agreements about the appropriateness of the 35 percent, or any other, factor.

Comment. One commenter stated that the report, although using air quality standards as an indicator for significance, did not report by how much these standards would be exceeded, nor did it address parameters such as visual range and scenic quality. (478.)

Response. The air quality analysis included calculations of maximum total ambient concentrations resulting from NMGS. These projected concentrations were presented in both the Air Quality TR as well as the DEIS. In no instance was a violation of any state or national ambient air quality standard projected.

The analysis also included the effect of NMGS on visibility. The model used calculated projections of plume perceptibility and visual range reduction. Plume perceptibility was used as an indicator, and the results summarized in the TR and DEIS. Values of visual range reduction attributable to plumes are available in the visibility modeling documentation prepared by SAI.

Comment. On p. S-7, reference is made to "regional haze now visible" from CCNHP. NPS monitoring data do not indicate regional haze as a problem at CCNHP. Support for this statement is necessary. (498.)

Response. Comment is noted. The statement referenced on p. S-7 is in error. The Air Quality TR discusses regional haze and states that there is a potential for NMGS to contribute to regional haze; however, the TR does not mention regional haze in CCNHP. The statement on p. S-7 has been restated in the FEIS Summary as follows:

"Although not quantifiable, NMGS could contribute to regional haze."

Comment. Trace metals such as beryllium and cadmium should be discussed in quantitative terms.

The phenomenon of polycyclic aromatic hydrocarbons being volatilized during combustion and condensed back onto small fly ash particle surfaces should be discussed also, as well as the particle size distribution in actual emissions.

Estimates of ambient levels of respirable particulates should be made, in light of the likelihood of a new inhalable particulate standard. (474.)

Response. The beryllium and cadmium content of the coal is such that concentration increases of these substances due to combustion of the coal are estimated to be less than 1 ug/m^3 at the point of maximum concentration. (See response regarding lead and mercury emissions for further information on how this estimate is made.)

Emissions of particulate matter were calculated based on the maximum that would be allowed under federal New Source Performance Standards. The extent to which the particulate matter is composed of condensed hydrocarbons is difficult to determine and would not provide significant new information regarding air quality impacts with respect to state or national ambient air quality standards, or state or federal emission limitations.

The projected 24-hour maximum concentration increase of TSP is 5.7 ug/m^3 at a point close to NMGS. This value is below the 150 ug/m^3 state and national ambient air quality standard for TSP (24-hour average), and decreases rapidly with distance from NMGS. Again, it is unlikely that particle size distribution information would provide significant new information regarding ambient levels or health impacts.

Comment. Chapter 3 should include maps that show isopleths of pollutant concentrations, as well as listing air pollutant emissions from NMGS, since the TR may not be available to everybody. (532.)

Response. Although pollutant emissions from NMGS are estimated in the TR, isopleth diagrams were not prepared since it was not felt to be a vital part of the analytic presentation. Air Quality TRs are available to the public at the many locations mentioned in this document. The BLM office should be

contacted if there is interest in reading this document.

Comment. The federal secondary standard for TSP is 60 ug/m^3, not 75 ug/m^3, as shown on Table 2-4. (532.)

Response. The table referenced above does not label the 75 ug/m^3 as a secondary standard; it lists it as a federal ambient air quality standard. Although the federal secondary standard for TSP is defined to be 60 ug/m^3, it is also defined to be used for planning purposes only. Thus, for all practical purposes, the EPA enforces the 75 ug/m^3 standard. It should be noted, however, that the NMEID enforces the 60 ug/m^3 annual TSP standard.

Comment. One commenter expressed concern over the possible health effects that radionuclides released during combustion of coal would have. (131, 169.)

Response. The amount of radionuclides that could potentially be released during combustion of coal was explored in detail in the Air Quality TR. The analysis conducted shows that the release of radioactive material from NMGS would be below the radiation protection guides set forth in the Code of Federal Regulations (10 CFR 20). Specifically, the total concentration of radionuclides is projected to be below 0.009 percent of the Nuclear Regulatory Commission standard, at the point of maximum impact (8 miles southeast of NMGS). The increase in concentration is a negligible fraction of typical baseline levels that occur in the San Juan Basin, as discussed on p. 3-23 of the Air Quality TR.

Comment. Page 1-8. Table 1-2 indicates that there was no consideration of alternative mitigation methods for sulfur and nitrogen oxide emissions other than PNM's proposal. This is a violation of NEPA.

Page S-3. No SO_2 control alternatives were considered other than PNM's proposal.

Omitting any discussion of alternative SO_2 pollution mitigation methods flatly violates the CEQ NEPA regulations, which require an analysis of "mitigation not already included."

Page S-3. No NO_x control considered other than PNM's proposal. (7.)

Response. Alternatives to PNM's proposed air pollution control system were considered and evaluated by the BLM. In Table 1-2 (p. 1-8) of the DEIS, and again on pp. 1-15 and 1-16 of the DEIS, BLM described the alternative pollution control systems considered. The regulation of air emissions and liquid discharges is under the control of the U.S. Environmental Protection Agency (EPA) and is beyond the jurisdiction of the BLM. However, in the preparation of the EIS, and for the purpose of the EIS, BLM has satisfied itself that alternative plant systems have been adequately addressed. The detailed evaluation of mitigation methods of sulfur and nitrogen oxide emissions would be the responsibility of the EPA through an entirely different and independent permitting process.

Geologic Setting

Comment. The San Juan Basin of northwestern New Mexico and southwestern Colorado is an asymmetric structural basin or depression that contains a sequence of sedimentary rocks that is as much as 15,000 feet thick. The rock sequence of the San Juan Basin is not continuous; gaps in the record are present (Appendix I). The exposed rocks of the San Juan Basin affected by the management and development programs described in the various BLM documents consist of a sequence of rocks deposited as the Late Cretaceous seaway advanced and withdrew from the Western Interior. This uppermost part of the rock sequence is more than 6000 feet thick and includes strata of Late Cretaceous, Paleocene and Eocene age and is mantled by Quaternary sediments. Gaps exist in this part of the rock record as well. A part of the Late Cretaceous rocks of the Fruitland Formation, consisting of fine-grained, light-gray sandstones, brownish siltstones, shales, dark carbonaceous shales and coal beds, contain most of New Mexico's coal resources. The average thickness of the Fruitland Formation is about 300 to 350 feet. The Fruitland Formation overlies the Pictured Cliffs Sandstone and underlies the

Kirtland Shale. In many areas where the Fruitland Formation is exposed, characteristic badland topography is well developed. One such badlands region, the Bisti badlands, has become the center of debate and controversy. (478.)

Response. Prior to preparing the Geologic Setting TR, the New Mexico Bureau of Mines and Mineral Resources (NMBM & MR) was visited, geologists on its staff were interviewed, and copies of all of its available maps and reports pertaining to the project area were obtained. These maps and reports constitute a tremendous resource, and they were consulted and referenced for their detailed descriptions of the geology of the project region. For that reason, the Geologic Setting TR cites a large number of reports published by the NMBM&MR and by other agencies. In accordance with CEQ guidance, this publically-available information was not repeated in the DEIS. The data obtained from the NMBM&MR and its publications constituted a valuable partial basis for evaluating the environmental consequences of the proposed action. The revised wording presented by the reviewer(s) does not appear to present any new basis which would alter the analysis or its findings. The text has, therefore, not been revised in the FEIS.

Paleontology

Comment. The evaluations of the significance of the paleontological resources that may be affected by the proposed NMGS project is overstated, and some of the descriptions of formations and included fossils are inaccurate. (124, 164[a], 478.)

Response. There is much variation in the professional paleontological community as to the relative value and meaning of specific fossil localities or research questions in the San Juan Basin. The BLM has selected the more conservative approach to paleontological resource management as its baseline for making impact evaluations. In addition, the applicant is committed to a thorough paleontological resource management program as part of the NMGS project, including inventory and evaluation of resources and the recovery of significant fossils prior to the beginning of any ground-disturbing construction, as stated on DEIS p. 1-28.

Comment. The New Mexico Museum of Natural History should be added to the list on DEIS p. 3-53 of future cooperators in any paleontological studies related to the NMGS project. (143, 172, 232.)

Response. See FEIS p. 3-64 for this addition.

Comment. The DEIS does not have an adequate discussion of paleontological resource management policies, and inventory and mitigation programs, to be followed prior to implementation of the proposed action. (232).

Response. The National Environmental Policy Act requires an assessment of proposed actions on presently known paleontological resources (see Paleontological Resources TR). It does not set forth requirements for a paleontological resource management program; that is referenced in the Antiquities Act of 1906 and the Federal Land Policy and Management Act and related BLM guidelines. The applicant commited to a paleontological resource management program in the DEIS. Compliance with these management programs would lead to mitigation of significant direct impacts to paleontological resources.

Hydrology

Comment. In the section of the DEIS on the environmental consequences of the proposed project (p. 3-28), the effect of the required releases from Navajo Reservoir upon the downstream trout fishery and recreation use needs to be discussed. The effect on floodplains and wetlands should also be discussed. (484, 505.)

Response. The resource areas mentioned above (except for recreation) are discussed in the sections on "Proposed Intake Structure and Water Pipeline P1" and "Alternative Intake Structure and Pipeline P2" on pp. 3-30 to 3-34 of the DEIS. Recreation impacts were not significant and, therefore, were not discussed in the DEIS; however, the analysis of recreation impacts is presented in the Recreation TR.

Comment. The impact of the proposed source of water supply for NMGS on seasonal lake levels in Navajo Reservoir and in the "Quality Stream Fishery" reach of the San

Juan River below Navajo Dam should be explored in more depth. (266, 478, 484, 505.)

Response. The proposed source of water supply (35,000 ac-ft/yr from Navajo Reservoir) represents about four percent of the historic average annual streamflow of the San Juan River that has been released or bypassed from Navajo Reservoir. Since shortly after completion of the Navajo Dam and Reservoir, the release schedule has been set to provide, as a minimum, sufficient quantity of water to meet the demand of all downstream diversion requirements in New Mexico and to maintain the quality trout fishery within the first 7 miles downstream of Navajo Dam. During the historic operation of Navajo Reservoir, both the streamflow below Navajo Dam and the lake level have varied considerably on a seasonal basis.

During average and wet periods, it would not be necessary to release water from Navajo Reservoir for NMGS. Management of Navajo Reservoir for the above-stated objectives would provide sufficient water at the proposed (Farmington) or alternative (Bloomfield) intake locations for diversion of 48 cfs for NMGS. Therefore, no impact on lake levels in Navajo Reservoir would result. Also, the intake locations are downstream of the quality trout fishery so no effect on streamflows in the trout fishery would result.

During a dry period when the San Juan River would be administered on a priority basis, the Bureau of Reclamation would not have to release more water from Navajo Dam to satisfy water rights senior to the United States than the natural streamflow entering Navajo Reservoir. The Bureau of Reclamation could potentially release sufficient water from Navajo Reservoir, when physically available, to meet the downstream diversion requirements of senior water rights, because of an added interest to preserve the quality trout fishery; however, there is no legal requirement to release water from Navajo Reservoir to preserve the trout fishery. The Proposed Action water supply source for NMGS would be one or more contracts for Navajo Reservoir water, which would allow NMGS to call for release of up to 48 cfs from Navajo Dam during a dry period when streamflow at the intake location would otherwise not be sufficient. Therefore, during a dry period, up to 48 cfs released from Navajo Reservoir specifically for NMGS would have a beneficial impact on the quality trout fishery.

Although lake levels in Navajo Reservoir would most likely be lower than average during a dry period, the hydrologic analyses performed for the EIS to assess the physical availability of water for NMGS assumed that the water surface elevation of Navajo Reservoir would not drop below elevation 5990 feet (which is the invert elevation to the Navajo Indian Irrigation Project canal at its diversion from Navajo Reservoir). Storage of water in Navajo Reservoir below this elevation is approximately 672,500 ac-ft.

Comment. The EIS should discuss the total cumulative impacts from water use for the planned developments in the San Juan Basin. Surface-water uses should include: NMGS; growth in Farmington and Gallup; and any coal gasification plants. Ground-water uses should include: NMGS plus the possible New Town; planned coal and uranium mines, the Escalante power plant, and existing users. The effects of ground-water withdrawals on surface flows and vice versa should be discussed in a worst-case fashion. The map on p. 4-28 [sic] of the Hydrology TR, showing total drawdowns due to existing and projected ground-water users, should be moved into the EIS document itself. (484.)

Response. The Hydrology TR considers historic, present, and projected water use from Baseline 1 and Baseline 2 projects plus NMGS in the analysis of impacts on other water users (see Sections 3.E and 4.E of Hydrology TR). These uses correspond to all the ones specified in the comment and more, with the exception of the possible New Town and the Gallup-Navajo Indian Water Supply Project. The effects of the possible New Town have been generally analyzed in Sections I, II and III of the DEIS. The Gallup-Navajo Indian Water Supply Project was not part of the Baselines 1 and 2, as discussed on p. 3-19 of the Hydrology TR.

The effects of ground-water withdrawals on surface flows and vice versa have been analyzed on a worst-case basis (see the

Hydrology TR, pp. 4-71, 4-72, 4-125 and 4-126.)

Maps 4-24 and 4-26 (pp. 4-103 and 4-105, respectively, of the TR) show the drawdown in the potentiometric surface of the Westwater Canyon Member aquifer due to baseline water users plus NMGS in years 2010 and 2030, respectively. The ground-water users whose withdrawals were simulated are tabulated in Table 4-13 (p. 4-92 of Hydrology TR).

Only significant impacts to hydrology were summarized, as per the CEQ regulations. Detailed analysis and supporting documentation are provided in the Hydrology TR.

Comment. The EIS and supporting documents do not provide information to assess the validity of the 35,000 ac-ft/yr estimate of water need for NMGS. Evaporative losses, such as from the storage reservoir near the plant site, should also be assessed. (136, 458, 484, 497.)

Response. The water requirements for NMGS would be 34,560 ac-ft/yr. This value assumes the following: (1) "all-wet" evaporative cooling; (2) 2000 MW generating capacity; (3) 100 percent plant capacity. A detailed breakdown of water use by NMGS is presented on Figure 2-3 of the Project Description TR. This figure indicates that evaporative losses from the storage reservoir and storage ponds have been included in the 34,560 ac-ft/yr value of water use.

The long-term average annual capacity factor for NMGS is assumed to be 65 percent, which would correspond to water requirements of 22,500 ac-ft/yr (see the Project Description TR). The 35,000 ac-ft/yr used to assess the environmental consequences of NMGS on other water users and on hydrologic conditions is, therefore, a worst-case value (maximum water use corresponding to 100 percent plant capacity).

Comment. The statement on p. 1-17 of the DEIS, that water transport in the water supply pipeline would start in 1990, is false, "...since Unit 1 of NMGS is not planned until 1995." (457.)

Response. The analysis of environmental consequences considered in the EIS assumed that Unit 1 of NMGS would start operation in 1990.

Even if Unit 1 were not to start operation until 1995, the environmental consequences of the use of the Proposed Action and Alternative 1 water supply sources on other surface- and ground-water users would be essentially the same as discussed in the EIS and the Hydrology TR.

Comment. Since no groundwater has even been withdrawn from the proposed aquifer source [sic], how can PNM assume it can be a reliable source or not interfere with existing area ground-water withdrawals? (458, 484.)

Response. Neither of the above statements has been assumed in the evaluation of the environmental consequences of use of the wellfield (Alternative 1 water source for NMGS). The wellfield is proposed to consist of 16 wells that would be completed in the Westwater Canyon Member of the Morrison Formation.

Water throughout the San Juan Structural Basin has been withdrawn from the Westwater Canyon Member, including the testing of an old oil exploration well several miles west of the NMGS plant site (Apache-Foshay #1 or Bisti well; Section 9, T23N., R13W).

The model used to assess the environmental consequences of use of this wellfield showed that withdrawal of 15,000 ac-ft/yr from the wellfield, as proposed, was possible without dewatering of the aquifer in the vicinity of the wellfield (i.e., potentiometric surface of Westwater Canyon Member would be above the top of the aquifer by over 2000 feet). The aquifer parameters used in this model were based on tests of the Westwater Canyon Member throughout the San Juan Structural Basin (see discussion in Section 4.D.4 of the Hydrology TR). The model also showed that significant impacts (drawdowns in the potentiometric surface of greater than 25 feet) to other ground-water users whose wells are completed in the Dakota Sandstone, Westwater Canyon Member, and Entrada Sandstone aquifers would occur from use of

the wellfield for NMGS (see Section 4.E of the Hydrology TR for additional information).

Comment. Several comments inquired as to why a map showing the proposed locations of the 16 wells in the wellfield (Alternative 1 Water Supply Source) was not presented in the DEIS. The comments also suggested that the effects of the ROWs for construction and operation of roads and pipelines for the wellfield should be considered on a level of detail consistent with the rest of the proposal. (457, 484, 496.)

Response. The surface impacts of the wellfield (roads, collector pipelines, booster pumping stations) have been analyzed and included in the FEIS.

A map showing the location of the 16 proposed wells is presented in the Hydrology TR (Map 4-1, p. 4-2 of Hydrology TR). A minor revision of the wellfield locations has been added to the FEIS (see Map 1 in the Water Wellfield Gathering System section.)

The Paragon Resources, Inc., (subsidiary of PNM) application for ground-water rights in the San Juan Underground Water Basin is discussed in detail in Section 4.B.2 of the Hydrology TR.

Comment. Other alternative uses of the 35,000 ac-ft/yr from the San Juan River (Proposed Action water supply source) are not discussed in the DEIS. What are the costs and benefits that would be foregone as a result of using this water for NMGS, rather than for these other alternative uses? (133[a], 458.)

Response. The 35,000 ac-ft/yr Proposed Action water source is assumed to come from assignment of Utah International's contract (20,000 ac-ft/yr) and the making of a new contract (15,000 ac-ft/yr) for water from Navajo Reservoir on the San Juan River. These contracts are part of the 100,000 ac-ft/yr certified by the Secretary of Interior to be available for municipal and industrial contracts through the year 2005 (see Section 3.D.3.b of the Hydrology TR). The uncertainty involved with the making of a new contract for 15,000 ac-ft/yr is addressed on pp. 3-37, 3-38, and 3-43 of the Hydrology TR (as revised in FEIS) and in the assessment of the proposed assignment previously presented in the FEIS.

Other alternative uses of the 20,000 ac-ft/yr of Utah International's contract water would consist of uses made by Utah International or other assignees of this water. Alternative uses of the other 15,000 ac-ft/yr (new contract) would have to consist of municipal and/or industrial uses. The Bureau of Reclamation is considering such a contract as a water-supply source for the Gallup-Navajo Indian Water Supply Project. The Bureau of Reclamation has received applications to enter into new contracts for Navajo Reservoir water from Consolidation Coal Co. and Ark Land Company (Arch Minerals Co.). A cost-benefit analysis of alternative uses is outside the scope of this EIS because such analysis is inherent in the Bureau of Reclamation's decision-making and the type of use could not change under existing policies.

Comment. Several comments questioned the basis for the assumption that the New Mexico State Engineer has authority over water on or beneath Indian lands. In particular, the Jicarilla Apache Tribe claims that "the State Engineer has no authority whatsoever over the Tribe's ground water. It has no jurisdiction to permit withdrawal of ground water which affects the reservation." (161, 496, 519.)

Response. Table 1-1 of the DEIS lists a "Permit to Appropriate the Underground Waters of the State of New Mexico," obtained from the New Mexico State Engineer, as one of the potentially required permits that PNM would have to obtain to use the wellfield as a source of water supply for NMGS. The State Engineer would review the application for this permit to determine if the proposed water uses would impair existing surface- or ground-water rights.

The New Mexico State Engineer claims authority based on the ground-water code enacted in 1931 (New Mexico Statutes, Article 12, Chapter 72, NMSA, 1978 [annotated]). This subject is discussed in detail in Section 4.B.1 of the Hydrology TR.

The extent of ground-water rights of Indian tribes and non-Indian water users is being adjudicated as part of the San Juan stream system suit in the District Court for San Juan County, New Mexico. The outcome of this suit conceivably could affect the availability of ground-water for NMGS (Alternative 1 water supply source).

Comment. The Summary of Potential Impacts for Comparing Alternative Water Supply Systems (DEIS Table 1-8) shows a drawdown of 25 feet in wells of ground-water users whose wells tap the Westwater Canyon Member, Dakota Sandstone and Entrada Sandstone aquifers in the San Juan Structural Basin. (161.)

Response. Changes are provided on FEIS p. 1-42, Table 1-8, in response to this comment.

Comment. In the event that all 35,000 ac-ft/year are needed from ground-water sources for the NMGS water supply, the projected impacts of such an event should be evaluated. (111, 457.)

Response. The use of 35,000 ac-ft/yr from ground water for NMGS was evaluated early in the EIS process and found to be technically infeasible over the life of the project.

Comment. It is unreasonable to presume that one can calculate the impact due to future ground-water withdrawals for uranium mining in the San Juan Basin, because such "projected, massive withdrawals" probably will not happen. (165.)

Response. The analysis of ground-water withdrawals for uranium mining and milling in the San Juan Basin (including mine dewatering) is reasonable and reflects the present slow-down of the uranium mining industry. It is unreasonable to assume that the bottom has permanently fallen out of the uranium market and that mining activity will never be greater than the activity at present.

The analysis of ground-water withdrawals for uranium mining discussed in the Hydrology TR assumed that uranium mines that were shut down or on which construction was halted in the early 1980s would not resume production or construction until 1990 (see p. 4-48 of Hydrology TR).

Also, estimates of future ground-water pumpage in the EIS were more modest in comparison with earlier studies. The model used to predict the impacts of the NMGS wellfield (Alternative 1 water source) simulated a maximum pumpage from uranium mines in the San Juan Basin in the period 1995-2000 of approximately 40,000 ac-ft/yr (see Tables 4-9, 4-10 and 4-16 of the Hydrology TR). Whereas, in the same 1995-2000 period, Lyford, Frenzel and Stone (1980) simulated ground-water pumpage for uranium mining of approximately 79,000 ac-ft/yr in their medium-range projection and approximately 99,000 ac-ft/yr in their high-range projection.

Comment. Given the recent history of the Plains Electric Generating Station, how can it be assumed that water rights holders in the San Juan Basin would not be impaired by the large amounts of water withdrawn from ground-water supplies for NMGS? It is inexcusable that this problem is not dealt with in the EIS. (52.)

Response. Text has been revised on FEIS p. 3-33.

Comment. Is the 35,000 ac-ft/yr required for NMGS really physically available from the San Juan River or is the EIS "but another paper" analysis of water rights? (178, 457.)

Response. Operations studies of the San Juan River system in New Mexico performed by the U.S. Bureau of Reclamation and used for the analysis of environmental consequences demonstrate that the 35,000 ac-ft/yr required for NMGS would be physically available. The discussion of the impacts of the use of this water (see Sections 3.D and 3.E of the Hydrology TR) makes the distinction between physical and institutional availability of water.

Comment. Several comments stated that water use from the San Juan River for NMGS would affect downstream water users,

especially irrigation users in the summertime when the streamflow decreases. This information should be discussed in the EIS. (75, 136, 291, 484.)

Response. The impacts on other water users of the use of 35,000 ac-ft/yr from Navajo Reservoir for NMGS (average streamflow diversion of 48 cubic feet per second) were analyzed in detail in Section 3.E.2 of the Hydrology TR. This analysis included an examination of impacts during the summer irrigation season of the critical drought period. During such a period, there would be no net decrease in streamflow downstream of the intake (diversion structure) for NMGS because water would be released from Navajo Reservoir (if called for) specifically for use by NMGS.

It is important to differentiate between direct flow water rights in the San Juan River and rights to water stored in Navajo Reservoir. Most irrigation users downstream of Farmington have direct flow rights to the San Juan River. These rights are senior (have priority) to the rights of the United States in Navajo Reservoir. During an extended drought period or other years of low streamflow, these irrigation users may make a priority call for water in the San Juan River; however, the United States would be obligated only to bypass the natural streamflow entering Navajo Reservoir via releases from Navajo Dam. These bypasses of natural streamflow may or may not be adequate to supply the irrigation diversion requirements of all users with direct flow water rights, and further allocation of water on a priority basis among these irrigation users may be necessary. The United States may not store additional water in Navajo Reservoir during the period in which a priority call by downstream senior water rights is in effect. However, the United States may release water previously held in storage in Navajo Reservoir to satisfy the obligations of irrigation, municipal, and industrial users that have rights to this stored water.

Both the Proposed Action and Alternative 1 water sources for NMGS assume that surface water rights would be obtained through contracts for industrial water use from Navajo Reservoir. Therefore, assuming NMGS had obtained such contract water from Navajo Reservoir, releases from Navajo Reservoir could be made during a drought period to satisfy the entitlement of NMGS to this water (subject to shortage provisions of the water contracts that require proportionate sharing of any water shortages among water users of Navajo Reservoir, and to the shortage provision in Article 7 of the Agreement and Assignment between Utah International and Paragon Resources, Inc. [PNM] that requires Paragon to first bear any curtailment of delivery of water from Navajo Reservoir to Utah International and their assignees).

Comment. There are no straightforward, comprehensive statistics on how much water is available, over a 10-year period, in the San Juan River. There are no statistics on who has been using this water during this time and how much has been used. (205.)

Response. Water use in the San Juan River Basin over the last 10 years is presented in Table 3-3 of the Hydrology TR. A detailed analysis of water availability over the lifetime of NMGS has been performed and is discussed in detail in Section 3.E.1 of the Hydrology TR.

Comment. The origin and definition of the flow value of 520 cubic feet per second at Farmington is not explained (DEIS p. S-7). (478, 505.)

Response. The parenthetical statement on DEIS p. S-7 "(...low flow; defined as streamflow of 520 cfs at Farmington)" has been clarified. A streamflow value of 520 cfs at Farmington is the minimum required streamflow that would satisfy senior water rights in New Mexico downstream of Farmington, the other projected downstream uses on BLM's Baselines 1 and 2 (portion of Utah International's contract for Navajo Reservoir water that is not assigned to NMGS, and San Juan Power Plant), and the 48 cfs required for NMGS. The derivation of this streamflow value and its use in the evaluation of impacts is discussed in detail in Section 3.E.2 of the Hydrology TR.

Comment. Several comments stated that different values of streamflow were pre-

sented on DEIS p. 2-30. It was not clear what these values represent and whether they realistically indicate low streamflow. One comment stated that use of historic flows in an assessment of future streamflow conditions is misleading. (478, 505, 532.)

Response. Section 3.C of the Hydrology TR discusses the hydrologic characteristics of the San Juan River basin in detail. This discussion includes a review of historic average streamflow conditions at several locations (Table 3-1) and projected future streamflow at these locations during the "critical period" of an operation study performed by the Bureau of Reclamation. The operation study presented in Section 3.C is the one that most closely represents the baseline conditions (BLM's Baseline 1 and Baseline 2) during the life of NMGS. On p. 3-18 of the Hydrology TR it is stated:

> Low-flow characteristics of streamflow in the San Juan River are of principal importance in evaluating the effects of use of water from Navajo Reservoir for NMGS.... Such low-flow duration data are readily available; however, these historic low-flow characteristics would not be representative of how the San Juan River might be regulated during the lifetime of NMGS. At that time, the Navajo Indian Irrigation Project would be in full operation. The Animas-LaPlata Project may be in operation, which would reduce the tributary inflow to the San Juan River at Farmington during peak flows but may increase tributary inflow during low water years. Therefore, results of San Juan River operations studies, which simulate future supply, storage, and use of water, were used to estimate the stream flow characteristics in the San Juan River during the life of NMGS.

The origin of the values of streamflow presented on DEIS p. 2-30 are as follows:

- 2400 cfs is the historic average annual discharge of the San Juan River at Farmington for the period of record (1912 to 1981)
- 700 cfs is the average flow of the San Juan River at Farmington during the critical period that was simulated in the operation study discussed above (see Table 3-2 of Hydrology TR). It should be noted that the analysis of impacts of NMGS on streamflow conditions in the San Juan River examined monthly streamflow in the San Juan River at Farmington during the critical period (see Section 3.E.2 of Hydrology TR). The average streamflow during the critical period (Table 3-2) has been presented for comparison with historic streamflow values (Table 3-1).

Comment. In the determination that there would be no significant downstream impacts due to diversion of 48 cfs from the San Juan River (DEIS p. 3-28), which one of the comparative flows was used and how was the indicator of significance determined? One comment stated that the indicators of significance should reflect acceptable economic effects as well as acceptable amounts and kinds of change that would affect prior users' water supplies. (478, 484, 496, 505, 519, 532.)

Response. The 700 cfs average streamflow in the San Juan River at Farmington during the critical period (DEIS p. 2-30) was used as the basis for comparison. Fifteen percent (indicator of significance) of this value is 105 cfs; 48 cfs diverted at the intake location for NMGS is much less than 105 cfs and, therefore, would not be considered as a significant impact.

Two indicators of significance have been established for assessment of impacts on surface-water users (see Hydrology TR, p. 2-6). The first indicator is "project causes a predictable decrease in water available to existing users." This indicator was used to assess if the Proposed Action water supply source for NMGS would affect either the institutional or physical availability of water to Baseline (existing and projected future) water users, including those whose water rights have priority over those from Navajo Reservoir. This assessment was performed based on a river operations study that simulated the streamflow conditions in a drought period ("critical period") during the lifetime of NMGS (DEIS, p. 2-30). As stated in Section 3.E.1 of the Hydrology TR, NMGS would, at a maximum, deplete the available supply

of water in the San Juan River Basin in New Mexico by 35,000 ac-ft/yr. However, no significant impacts on the physical or institutional availability of water in the San Juan River Basin or the Colorado River Basin would result from this depletion, because NMGS would not cause shortages in water available to present and some projected future water users. Therefore, economic effects on these water users would be insignificant as well.

The second indicator is "project causes the average daily flow of any perennial stream or spring to decrease by more than 15 percent." This indicator was used to assess the effects of diversion of water from the San Juan River on downstream users, which was an evaluation of streamflow characteristics during the lifetime of NMGS, irrespective of the institutional constraints on the availability of water. It should be pointed out that water rights on the San Juan River senior to those of the United States in Navajo Reservoir, by making a priority call for water, are entitled only to bypasses of natural streamflow entering Navajo Reservoir but are not entitled to water in storage in the reservoir. As was stated on DEIS p. 3-28, reductions in the average streamflow downstream of Farmington during the critical drought period due to diversions of 48 cfs for NMGS would not be significant. During parts of this drought period when NMGS may call specifically for release of water in storage in Navajo Reservoir, there would be zero net reduction in streamflow downstream of Farmington due to NMGS.

Comment. The Bureau of Reclamation Upper Colorado Region recommends that a table be included in the DEIS that presents high flows of record in the San Juan River, average flows, and data from specific surface-water hydrological analyses. (505.)

Response. These hydrologic data, except for high flows of record, are presented in Section 3.C and Appendix D of the Hydrology TR. BLM feels that the statistical summary of high flows presented in the Vegetation section on DEIS p. 3-32 is sufficient for assessment of impacts on riparian vegetation along the San Juan River.

Comment. The issue of land subsidence associated with withdrawal of 15,000 ac-ft/yr of ground water for NMGS (Alternative 1 water source) has not been adequately studied. The change in conditions of the Westwater Canyon Member aquifer from an artesian to an unconfined aquifer might be accompanied by reductions in porosity and permeability of the aquifer. (169, 437.)

Response. The analysis of potential land subsidence due to ground-water withdrawals assumed that confined conditions would persist (see Table 4-19 of the Hydrology TR). The drawdown in the Westwater Canyon Member aquifer, and the Dakota Sandstone and Entrada Sandstone aquifers, due to withdrawal of 15,000 ac-ft/yr from the Westwater Canyon Member aquifer would be considered significant impacts, but would not be enough to dewater the aquifers. Ground water would still occur under confined conditions in the aquifers.

Comment. Is a Corps of Engineers Section 404 permit required for construction of the intake structure on the San Juan River? (252, 505.)

Response. As indicated in Table 1-1 on DEIS p. 1-5, a Section 404 permit is required.

On July 22, 1982, revised regulations for Section 404 of the Clean Water Act (33 CFR 320-330) were published in the Federal Register. Some of these changes are pertinent to the proposed NMGS facilities. Construction of the proposed pipeline crossings and transmission line crossings may be performed under the nationwide permit for utility lines. However, if temporary structures are to be constructed using material other than that excavated from the trench, an individual Section 404 permit would be required. There are also nationwide permits for minor road crossings and discharges less than 10 cubic yards. No reports or statements of intent are required to use nationwide permits; however, the person responsible for the project must assure compliance with all conditions of the permit. An individual Section 404 permit would still be required for the intake structure on the San Juan River.

Comment. The claim that the plant would have no significant impact on the region's water seems dubious at best. Large-scale use of ground water away from major rivers can be considered the mining of water. (229.)

Response. Significant impacts from the use of 15,000 ac-ft/yr of ground water for NMGS (Alternative 1 water source) would result, as discussed on DEIS pp. 3-28 through 3-30.

Comment. There is no evidence that any surface-water hydrological analyses were made, only a cursory comparison between the proposed 48 cfs diversion and several other available flow values. (505.)

Response. A detailed analysis of the effect of the proposed use of water from Navajo Reservoir on (1) existing users and projected, authorized and planned future users; and (2) streamflow characteristics in the San Juan River was performed and is presented in Section 3 of the Hydrology TR. This analysis relied in large measure on the operations studies of the San Juan River performed by the Southwest Region of the Bureau of Reclamation.

Comment. How will Utah International's and PNM's utilization of their existing water rights on the San Juan River affect the water rights of the Navajo Tribe? (194.)

Response. This comment refers to Utah International's direct flow rights (consumptive use of 39,000 ac-ft/yr) to the San Juan River for the Four Corners Power Plant, Utah International's contract for industrial water (consumptive use of 35,300 ac-ft/yr) from Navajo Reservoir and PNM's contract for Navajo Reservoir water (consumptive use of 16,200 ac-ft/yr) for the San Juan Generating Station. These water uses were included among the baseline (present and projected water uses) analyzed for the EIS to establish the baseline streamflow conditions during a drought period during the lifetime of NMGS. As discussed in Section 3.C and 3.E.1 of the Hydrology TR, the operation study of the San Juan River system predicted no shortages of water during the critical period to the present and projected water users in the San Juan River basin in New Mexico. One cannot speculate on how the water rights of the Navajo Tribe would be affected until these rights have been determined in the San Juan Stream System adjudication suit.

Comment. The EIS should address the effects of withdrawals of ground water for NMGS and the pumping in the Crownpoint uranium area. (226, 496.)

Response. Pumping in the Crownpoint area for municipal water use and for dewatering of existing and proposed uranium mines (included in BLM's Baseline 1 and Baseline 2) was simulated by the ground water model used to assess the impacts of use of 15,000 ac-ft/yr of ground water for NMGS. The effects of this ground-water use are presented in Section 4.E of the Hydrology TR.

Comment. NMGS would require 35,000 ac-ft/yr of water and the coal mining would require 16,550 ac-ft/yr. Is this amount not over half the annual water supply being used by the City of Albuquerque? Have the effects of this potential increased usage on the many present users of water in the region such as the Jicarilla Apaches been fully considered? (396.)

Response. The effects of the increased use of 35,000 ac-ft/yr for NMGS on present and projected future users have been fully considered in the Hydrology TR. Significant impacts have been summarized in the EIS.

The City of Albuquerque consumed approximately 46,000 ac-ft of water in 1977 (Albuquerque Journal, November 6, 1978). The city diverted about twice that amount.

Comment. Several comments express concerns that the EIS does not identify existing and proposed future uses of the water resources in the San Juan Region. The use of 35,000 ac-ft/yr of water for NMGS and the environmental consequences of such use should be related to these other pre-existing and proposed water uses. (28, 374, 491, 497.)

Response. The historic, present and some projected future water users, and the locations and quantities of such use, in the San Juan River Basin and San Juan Underground Water Basin (wells that tap Westwater Canyon Member, Dakota Sandstone and

Entrada Sandstone aquifers) are discussed in detail in Sections 3.C.3 and 4.C.4.c of the Hydrology TR. These users were based on (1) users that have legal entitlement to the water; (2) projects that have been authorized by Congress for planning and/or development; (3) other formal commitments of water from Navajo Reservoir made by the New Mexico Interstate Stream Commission; and (4) projects listed in BLM's Baseline 1 and Baseline 2, for which water use information was obtained from water rights files in the Office of the New Mexico State Engineer, permit applications, environmental impact statements and information from the New Mexico Energy and Minerals Department.

The analysis of the environmental consequences of: (1) use of up to 35,000 ac-ft/yr from Navajo Reservoir (Proposed Action); and (2) use of 20,000 ac-ft/yr from Navajo Reservoir and up to 15,000 acre-feet per year of ground water from the Westwater Canyon Member (Alternative 1) for NMGS has been considered in detail for these existing and projected future water users in the region (see Sections 3.C.2 and 4.D.6 of the Hydrology TR).

Comment. If PNM contracts for water from Navajo Reservoir from Utah International Inc., assignment of Utah International's contract must be approved by the Secretary of Interior. The term of the contract ends on December 31, 2005 unless it is extended by Congress. The Secretary of Interior is precluded from entering into long-term contracts for the sale of water from Navajo Reservoir for industrial uses until: (1) he has determined by hydrological investigations that sufficient water is reasonably likely to be available to fulfill the contract; (2) he has submitted such determination to Congress; and (3) Congress has approved the contract(s). This approval by Congress should be included in Table 1-1 of the DEIS (required permits, approvals, etc.). (Act of June 13, 1962, Public Law 87-483.)

If PNM were to apply for a new contract for an additional 15,000 ac-ft/yr of water from Navajo Reservoir, the Secretary of Interior would also follow the above procedure for certification of the contract and for submittal to Congress for their approval.

This procedure does not guarantee that the term of contracts for Navajo Reservoir water and the intended period of rise for NMGS would be the same. (269, 484, 511, 523.)

Response. PNM (Paragon Resources, Inc.) completed an agreement with Utah International Inc. on April 1, 1983 for assignment of 20,000 ac-ft/yr of Utah International's contract water from Navajo Reservoir. The Secretary of Interior still must approve this assignment. The other information stated in the comment is acknowledged, and is discussed in detail on pp. 3-1, 3-9 and 3-38 of the Hydrology TR.

Utah International Inc.'s contract further provides that should Congress extend the date for delivery of water beyond December 31, 2005, such extension would automatically apply to Utah International's contract. In no event would the term of Utah International's contract exceed August 31, 2022. For Navajo Reservoir water beyond this date, Utah International or Paragon Resources, Inc. would be required to make a new contract with the Secretary of Interior following the procedure discussed in the comment for certification and approval by Congress.

Comment. A lawsuit has been filed by the Jicarilla Apache Tribe in U.S. District Court in Albuquerque, New Mexico to declare null and void the water service contract for delivery of Navajo Reservoir water (consumptive use of 35,300 ac-ft/yr) to Utah International, Inc. (17, 115, 161, 269, 457, 484, 523.)

Response. This lawsuit relates to water supply sources for NMGS because PNM (Paragon Resources, Inc.) has signed an agreement with Utah International Inc. for assignment of 20,000 ac-ft/yr of Navajo Reservoir water. Since publication of the Hydrology TR and DEIS, the subject lawsuit was filed by the Jicarilla Apache Tribe and the agreement and assignment between Paragon Resources, Inc. and Utah International Inc. was completed. The lawsuit was filed on November 12, 1982 and is referenced as Jicarilla Apache Tribe v. United States of America, et. al., Civil No. 82 1327 M. This lawsuit is acknowledged as

an additional area of controversy that relates to the availability of a water source for NMGS.

Comment. Depletion of surface-water flows in the San Juan River by diversion or attributable to withdrawal of San Juan Basin ground water is subject to provisions of the Colorado River Compact, Upper Colorado River Basin Compact, and treaty with Mexico. (523.)

Response. The provisions of the Colorado River Compact, the Upper Colorado River Basin Compact, and the Mexican Treaty of 1944 were fully considered in the assessment of environmental consequences of use of the Proposed Action and Alternative 1 water supply sources. These compacts and treaty are discussed in Section 3.B.3 of the Hydrology TR.

Throughout the assessment of impacts of use of 35,000 ac-ft/yr of water from Navajo Reservoir, a distinction between institutional and physical availability of water was made. Use of this water for NMGS would not cause significant impacts on the institutional availability of water, since (1) water made available to NMGS by assignment of an existing contract would not affect New Mexico's ability to satisfy provisions of the Colorado River Compact, the Upper Colorado River Basin Compact and the Mexican Treaty; and (2) the Bureau of Reclamation would not make a new long-term contract for water from Navajo Reservoir unless the Secretary of the Interior has determined that sufficient water to fulfill this contract is available for use in the State of New Mexico, during the term of the contract, under the allocations made in Articles III and XIV of the Upper Colorado River Basin Compact, and Congress has approved the contract (see discussion in Section 3.B.4.b and 3.E.1 of the Hydrology TR).

The maximum depletions in the surface flow of the San Juan River and its tributaries due to pumping the wellfield (Alternative 1 water supply source) is 0.02 cubic feet per second. This flow reduction represents about 0.0009 percent of the average daily discharge of the San Juan River, at Shiprock, New Mexico (53 years of record), which is not considered to be a significant impact. The New Mexico State Engineer, in consideration of Paragon Resources, Inc.'s (PNM's) permit application for the wellfield, has the authority to require Paragon Resources to retire or commit to retire existing surface-water rights in the San Juan River to offset this depletion, if the State Engineer determines that surface-water rights would be impaired.

Comment. The statement on DEIS p. 3-28, "During drought conditions, this 48 cfs would be released from the Navajo Reservoir specifically for NMGS," is one of the few references in the report that NMGS would have a call on water stored in Navajo Reservoir. Is this the case or would NMGS have a diversion right, using only those river flows available at the diversion point? How often and in what quantities are releases required from Navajo Reservoir for NMGS? (505.)

Response. On p. 1-17 of the DEIS, the Proposed Action source of water supply for NMGS was stated as contract water from Navajo Reservoir. The discussion of stream flow in the San Juan River is presented to assess if movement of the point of diversion of Utah International Inc.'s contract water from near the Hogback (downstream of Farmington) to Farmington would result in significant impacts on streamflow in the San Juan River. (Note that PNM [Paragon Resources, Inc.] has signed an agreement with Utah International Inc. for assignment of 20,000 ac-ft/yr (average streamflow of 28 cfs) of that contract water to NMGS.) The other 15,000 ac-ft/yr of the Proposed Action water supply source (average flow of 20 cfs) is also assumed to be an industrial water supply contract from Navajo Reservoir.

Comment. The commenter disagreed with the statement that no significant impacts on the physical and institutional availability of water would occur due to PNM's use of 35,000 ac-ft/yr of water for NMGS (p. 3-42 of Hydrology TR). Another comment indicated there was insufficient coverage of San Juan River water rights issues. (204, 437, 457, 505.)

Response. The basis for the conclusion in the Hydrology TR that no significant impacts on

the institutional or physical availability of water would occur is presented on pp. 3-42 and 3-43 of the Hydrology TR.

The indicator of significance for a potential impact on surface-water users is that the project causes a predictable decrease in water available to existing users. In the case of the San Juan River, the historic drought period has been adopted as the standard of reference by which to judge the impacts on the physical availability of water to existing and projected surface-water users. Rules for water allocation in the event of shortages, which are specified in the Colorado River Compact and the Upper Colorado River Basin Compact, and in federal and state regulations, have been complied with in the evaluation of the impacts on the institutional availability of water to existing and projected surface-water users.

Physically, use of 35,000 ac-ft/yr from Navajo Reservoir for NMGS does not appear to cause a shortage of water to present and a specific list of projected water users in the San Juan River Basin, which are shown on p. 3-22 of the Hydrology TR. The total projected future uses range from 656,500 to 677,500 ac-ft/yr; these values are the total depletions shown in Table 3-3 of the Hydrology TR plus an additional 15,000 ac-ft/yr for NMGS, which is assumed (worst-case) to be a new contract from Navajo Reservoir. These quantities are less than 705,000 ac-ft/yr estimated, by operation studies of the San Juan River system conducted by the Bureau of Reclamation, to be physically available for depletion from the San Juan River Basin upstream of Shiprock, New Mexico, during the critical dry period (see Section 3.D.2 of Hydrology TR). Therefore, a decrease in water physically available for present and some projected future users in the San Juan River Basin in New Mexico due to NMGS is not anticipated.

Institutionally, water could be made available for NMGS without affecting New Mexico's ability to satisfy provisions of the Colorado River Compact and the Upper Colorado River Basin Compact (see Sections 3.B.3 and 3.D.3.b of Hydrology TR). The 20,000 ac-ft/yr, for which PNM has a proposed agreement with Utah International Inc. for assignment of a portion of an existing industrial water service contract from Navajo Reservoir, represents an approved use of the water through year 2005, which is recognized by the agencies (New Mexico Interstate Stream Commission and U.S. Bureau of Reclamation) that administer the water resources of the San Juan River system.

The Secretary of the Interior still must approve this assignment of Utah International's contract water to PNM. PNM's use of an additional 15,000 ac-ft/yr from Navajo Reservoir would be possible only by another assignment from an existing contract holder or by negotiating a new contract with the Secretary of the Interior. Before making a new long-term contract for water from Navajo Reservoir, Public Law 87-483 requires that the Secretary must certify that sufficient water to fulfill this contract is available for use in New Mexico during the term of the contract and submit this certification to Congress. Congress then must approve such a contract. In 1967 the Secretary made such a certification for contracts aggregating 100,000 ac-ft/yr through the year 2005. For extensions of the term of municipal and industrial contracts from Navajo Reservoir past the year 2005, the Secretary of Interior is required to make another certification as discussed above, and Congress must approve such extensions of existing contracts or any new contracts. Therefore, the legal framework established by Public Law 87-483 for making long-term contracts for water from Navajo Reservoir precludes existing and projected contract holders from causing impacts on the institutional availability of water in the San Juan River Basin in New Mexico and in the Colorado River Basin.

Comment. The withdrawal of 254,000 ac-ft/yr (sic) of water, which would be required for both NMGS and strip coal mining, would have a serious effect on ground-water resources in the area, an effect that could not be reversed. (194, 249.)

Response. The 254,000 ac-ft/yr figure to which this comment refers is not the amount of water from Navajo Reservoir which was

analyzed for use by NMGS and SJRRCL EISs. The maximum use of this water is 35,000 and 16,500 ac-ft/yr respectively. The commenter possibly was referring to the amount of water (254,000 ac-ft/yr) originally allowed to be depleted for the NIIP project.

Comment. Several commenters were concerned about the use of historic flows for assessment of future conditions also applies to the stream flow values of 3700 cfs, which is identified (DEIS p. 3-32) as occurring 10 percent of the time during the 1963-1981 period in the San Juan River at Farmington. (505.)

Response. The value of 3700 cfs is the stream flow value in the San Juan River at Farmington that has been equaled or exceeded 10 percent of the time in the period from 1963 to 1981. This period represents the years since Navajo Reservoir has regulated stream flow in the San Juan River. Use of historic high flows during this regulated period was judged to be of sufficient validity for estimation of potential impacts of reductions in peak flows on riparian vegetation, particularly cottonwood trees, due to diversion of 48 cfs at the intake structure for NMGS (DEIS p. 3-32). Since the reduction in peak flows was calculated to be less than or equal to 1.3 percent, it was judged that further analysis of peak flows in the San Juan River during the lifetime of NMGS (i.e., simulation by river operations studies) was not required.

Comment. Several comments were concerned that the significant impacts that would result from use of the wellfield for NMGS (Alternative 1 water supply source) would deplete drinking water supplies and water for livestock. These small-scale users are precisely those who cannot afford to drill deeper wells. The DEIS does not provide any reasonable nor viable alternatives for protection of these livestock and domestic water sources in the affected area once the groundwater resources have been depleted beyond recovery. One comment specifically suggested that "existing wells should be drilled down to the water table and equipped with adequate windmill heads or pump-jacks with sufficient energy provided to ensure no reductions in flow. The Bureau (BLM) should ensure that springs which are diminished are replaced with other waterings, either new wells or a pipeline system." Another comment stated that the BLM should include "some type of guarantee" that the people would still have water if the wellfield alternative is used for NMGS. (75, 115, 302, 374, 437, 478.)

Response. Suggested mitigation measures and monitoring programs for impacts on wells and springs due to use of the wellfield (Alternative 1 water supply source) for NMGS as summarized on DEIS p. 3-54 and discussed in more detail in Section 8.B.2 of the Hydrology TR. Specific alternatives for protecting livestock and domestic water sources as discussed above, such as deepening of existing wells, installation of larger pumps, the assumption of additional operating costs, and/or the furnishing of a substitute water supply, are included under the discussion of mitigation measures and are referred to by the general term, "replacement of the water supply."

At the present time, The New Mexico State Engineer has the jurisdiction and authority to review mitigation measures submitted by a water rights applicant in a so-called Plan of Replacement. When the State Engineer reviews the application for a permit to appropriate ground water that was submitted by Paragon Resources, Inc. (PNM) that would be the basis for pumping 15,000 ac-ft/yr from the Westwater Canyon Member for NMGS, he would determine which effects due to this proposed new appropriation would constitute impairment of existing water rights. Paragon Resources, Inc. may submit a Plan of Replacement to the State Engineer which would specify measures for the replacement of the water supply of existing water rights that otherwise would be impaired by the new appropriation, if approved. The State Engineer would review this Plan of Replacement in accordance with existing laws and procedures governing the appropriation of ground water in New Mexico (see Section 4.B.1 of Hydrology TR).

As noted in the section called Areas of Controversy, the State Engineers' authority over waters on or beneath Indian lands is subject to legal challenge at present.

Comment. Several comments inquired as to where the water to supply NMGS would come from and how PNM would secure the rights to that water supply. The comments pointed out that PNM does not own water rights for use at NMGS at present, and the legal uncertainties of obtaining those rights have been underestimated by the DEIS. Surplus water in the Upper Colorado River Basin upon which industrial contracts from Navajo Reservoir through 2005 are based may not be available after year 2030. There are many competing interests for water in the San Juan Basin, including several Indian tribes. One comment inquired if water use for NMGS would impact the prime farmland along the San Juan River through the purchase of irrigation water rights. Another comment inquired if PNM would use condemnation proceedings to acquire water rights. (17, 90, 105, 111, 136, 204, 253, 254, 269, 289, 302, 316, 335, 354, 374, 404, 437, 441, 444, 458, 484, 497, 523, 532.)

Response. Acquisition of the actual sources of water supply for NMGS is not resolved at present and is an area of controversy (identified by the public and agencies during the EIS process) that is outside of the scope of the EIS as stated on DEIS p. 1-42. The analysis of environmental consequences of NMGS assumed that the water source or sources would consist of the following: (1) assignment of 20,000 ac-ft/yr of Utah International Inc.'s contract water from Navajo Reservoir (Proposed Action, Alternative 1, Alternative 2); and (2) making of a new contract for 15,000 ac-ft/yr from Navajo Reservoir (Proposed Action), or obtaining water rights to pump 15,000 ac-ft/yr of ground water from the Westwater Canyon Member of the Morrison Formation from 16 wells in the San Juan Underground Water Basin (Alternative 1).

The water sources selected for analysis are realistic alternatives because: (1) Paragon Resources, Inc., a subsidiary of PNM, has completed an agreement with Utah International Inc. for proposed assignment of 20,000 ac-ft/yr of Utah International's contract water from Navajo Reservoir; (2) PNM has informally (by letter to New Mexico Interstate Stream Comission) expressed an interest in obtaining additional contract water from Navajo Reservoir; and (3) Paragon Resources, Inc. filed an application in 1977 for up to 40,000 ac-ft/yr from 3 aquifers in the San Juan Underground Water Basin, including the Westwater Canyon Member, of which 15,000 ac-ft/yr from the Westwater Canyon Member would be used for NMGS.

None of the water source alternatives considered in this EIS would involve the purchase of existing irrigation water rights along the San Juan River or the condemnation of existing water rights.

Except for the assignment of Utah International's water, PNM does not at present own other water rights or rights to water for the water supply source alternatives analyzed in this EIS. The assignment agreement between Paragon Resources and Utah International still must be approved by the Secretary of Interior before it can take effect. There are legal uncertainties involved with obtaining such water rights and rights to water, as well. The subjects of water rights and administration of surface- and ground-water resources have been discussed in detail in Sections 3.B and 4.B of the Hydrology TR.

The term of Utah International's contract with the United States ends on December 31, 2005. This term may be extended provided that the Secretary of Interior determines by hydrologic investigation that sufficient water to fulfill this contract is available for use in the state of New Mexico, during the term of the contract, under the allocations made in Articles III and XIV of the Upper Colorado River Basin Compact (see Appendix C of Hydrology TR). The Secretary of Interior must submit this certification to Congress, and Congress must approve this contract extension. However, the term of Utah International's contract cannot be extended beyond August 31, 2022. A new contract would have to be negotiated provided the Secretary of Interior can make such a certification as discussed above and Congress were to approve the new contract.

The Jicarilla Apache Tribe has filed a suit in U.S. District Court in Albuquerque, New Mexico to declare null and void the

water service contract for delivery of Navajo Reservoir water to Utah International Inc.

The Navajo and Jicarilla Apache Tribes claim extensive rights to surface water and ground water in the San Juan River Basin. These claims are being adjudicated in the San Juan stream system suit (State of New Mexico ex rel. State Engineer v. United States of America et al., Civil No. 75-184, District Court, 11th Judicial District, San Juan County, State of New Mexico).

Comment. Several comments state that the Navajo Nation and other Indian tribes claim and have extensive rights to the waters in the San Juan River Basin and in the aquifers underlying the respective reservations on the basis of the "reserved rights doctrine" (Winters v. United States, Arizona v. California, and other judicial extensions thereof). The comments state that these "Winters rights" are not discussed in the EIS. The Jicarilla Apache Tribe claims rights to all waters in the Navajo River on the Jicarilla Apache Reservation and states that use of water from Navajo Reservoir for NMGS would "preempt rights to Navajo River water." (161[b], 167, 175[a], 52, 105, 269, 289, 374, 441, 444, 458, 484, 511.)

Response. The water rights available to the Navajo Tribe, Jicarilla Apache Tribe and other Indian tribes in the San Juan River Basin and San Juan Underground Water Basin in New Mexico have never been quantified. The Tribes may possess rights under the so-called Winters doctrine (Winters v. United States, 207 U.S. 564 [1908]). The water rights of the Navajo Tribe and Jicarilla Apache Tribe are presently part of a water rights adjudication suit of the San Juan River system (State of New Mexico ex rel. State Engineer v. United States of America et. al., Civil No. 75-184, District Court, 11th Judicial District, San Juan County, State of New Mexico). The decision of this suit is still pending.

Comment. Several comments questioned the basis for values of both the consumptive use (depletion) of water by the Navajo Indian Irrigation Project (NIIP) and the water diversion required from Navajo Reservoir that would result in that depletion by NIIP for irrigation use. The Navajo Tribe is claiming that the statute authorizing NIIP (Public Law 87-483) entitles the tribe to greater water use. Also, irrigation return flows (diversion minus depletion) may be less than estimated by the New Mexico Interstate Stream Commission and the Bureau of Reclamation, which would throw into doubt the basis for calculating water availability from Navajo Reservoir. (52, 167, 441, 484, 511.)

Response. The assessment of impacts on surface-water users from use of 35,000 ac-ft/yr of water from Navajo Reservoir for NMGS (Proposed Action) assumed a diversion from Navajo Reservoir for NIIP of 357,000 ac-ft/yr and a depletion of 254,000 ac-ft/yr (see Section 3.B.5 and p. 3-19 of the Hydrology TR). The basis for these estimates was a memorandum from the Solicitor of the Department of Interior, dated December 6, 1974, that concludes that the Navajo Tribe is limited to the use of so much project water as would be reasonably necessary to irrigate the 110,630 acres authorized in the Navajo Indian Irrigation Project Act (Public Law 87-483) (the full text of this memorandum is presented in Appendix C of Hydrology TR). A recent memorandum from the Solicitor of the Department of Interior, dated April 23, 1982, further concludes:

> Congress expected Navajo water appropriations to be based upon beneficial consumptive use. Therefore, the required diversions up to a maximum of 508,000 acre feet, less return flows, that is, stream depletions, set the limit for Navajo beneficial water use on NIIP.

At the time the Hydrology TR was prepared, the Bureau of Reclamation estimated that a diversion of 357,000 ac-ft/yr and a depletion of 254,000 ac-ft/yr for NIIP was required for irrigation of 110,630 acres by a sprinkler system. The Bureau of Reclamation subsequently has revised these estimates to be a diversion of 376,000 ac-ft/yr and a depletion of 267,000 ac-ft/yr for sprinkler irrigation of 110,630 acres. The increased estimates of diversion and depletion from those used in this EIS and the Hydrology TR do not change the results of the impact assessment; that is, there would be no significant impacts on either the institutional or physical availability of water in the San Juan

River Basin to Baseline (existing and some projected) water users. Future water use for the Gallup-Navajo Indian Water Supply Project and other applicants for Navajo Reservoir industrial water-supply contracts were not part of the Baseline considered in the analysis of institutional availability.

The Navajo Indian Irrigation Project was initially planned to operate as a gravity irrigation system. The project feasibility report for NIIP estimated that a diversion of 508,000 ac-ft/yr would be required for this gravity irrigation system. The depletion of the project discussed in Congressional reports on House and Senate bills that eventually became the NIIP Act was approximately 280,000 ac-ft/yr and 252,000 ac-ft/yr, respectively. Therefore, return flows were estimated to be approximately half of the water diverted from Navajo Reservoir for gravity irrigation.

In 1972 and 1974, NIIP was redesigned to be an all-sprinkler irrigation project rather than the initially contemplated gravity irrigation project. The latest Bureau of Reclamation estimates of water requirements for NIIP (diversion of 376,000 ac-ft/yr and depletion of 267,000 ac-ft/yr) are based on the sprinkler irrigation system. The project is nearing 50 percent completion, and the final block of the project is scheduled to be completed in 1991.

There has been no systematic monitoring of return flows from the project by state or federal agencies, but return flows have been observed year-round in some washes in the project area (Ojo Amarillo Canyon, Gallegos Canyon) (personal communication between Dale Jackson, U.S. Bureau of Reclamation, NIIP Office, Farmington, New Mexico and J. Gilman, Woodward-Clyde Consultants, June 9, 1983). Using surface runoff as an estimate of present return flows (as percentage of water applied for irrigation) may underestimate the percentage of return flows that would result when NIIP is fully developed, because: (1) the water content of the alluvium in the washes is still increasing due to irrigation return flows; (2) year-round surface flow in the washes would not occur until the alluvial deposits are nearly saturated, which may take years of project operation; and (3) some return flows may be contributed as subsurface (ground-water) flow that is tributary to alluvium in the San Juan River.

As more of NIIP becomes operational, better estimates will be developed for the diversion of water from Navajo Reservoir required for irrigation of 110,630 acres and the depletions and return flows that would result. If the diversion is much greater than estimated by the Bureau of Reclamation at present, such that shortages to users with contracts for water from Navajo Reservoir result in dry years, all the users of water from Navajo Reservoir must share proportionately in these shortages as required in the NIIP Act (Public Law 87-483). If greater diversion requirements and/or less return flows than estimated for NIIP by the Bureau of Reclamation were to occur or to be predicted on a regular basis, this increased water use by NIIP may affect the ability of the Secretary of the Interior to certify that sufficient water is available to fulfill long-term contracts for municipal and industrial use of water from Navajo Reservoir beyond the year 2005. Given that the terms of the existing long-term municipal and industrial contracts end in 2005, the issue of water availability from Navajo Reservoir will be reviewed by the Secretary of the Interior prior to that time.

Comment. The Jicarilla Apache Tribe is concerned that the drawdown in the potentiometric surface in the Entrada Sandstone, Westwater Canyon Member, and Dakota Sandstone aquifers that would result from use of the wellfield for NMGS (Alternative 1 water supply source) might have an effect on the production of oil from wells in the Dakota and Entrada sandstones. The Dakota is becoming an increasingly important producing interval on the Jicarilla Apache Reservation and elsewhere in the San Juan Basin. Entrada Fields, while small, are also attractive production targets. "If the dewatering process adversely affects oil production (for example by eliminating a driving mechanism or by reducing the effectiveness of geologic traps), important hydrocarbon resources will be lost...." (153, 269.)

Response. In response to this comment an addition to the text has been made on FEIS pp. 3-33 to 3-35. The text revision explains

that is is conceivable that significant impacts to gas production in the Basin Dakota field could occur.

Comment. The DEIS estimates that pumping from the wellfield (Alternative 1 water supply source) would decrease the natural ground-water discharge to the San Juan River, Rio San Jose, Rio Puerco, and Puerco rivers by an estimated 0.09 cfs. Would there be any impact to the mainstems and tributaries of the Animas, La Plata, and Mancos rivers in Colorado? What would be the timing of any impact to these streams? (251.)

Response. A decrease in natural discharge of a surface stream due to ground-water pumpage could conceivably take place where the stream crosses the discharge area of an aquifer or where recharge to an aquifer where crossed by a surface stream is being rejected. The upper reaches of the Mancos, Animas, and La Plata rivers cross outcrops of the aquifers in the Westwater Canyon Member aquifer system in which significant drawdowns due to pumping the wellfield are predicted (Westwater Canyon Member of Morrison Formation, Entrada Sandstone, Dakota Sandstone). These areas are recharge areas for the above aquifers; however, ground-water recharge probably is not being rejected. Therefore, any significant drawdowns that occurred in these areas due to the NMGS wellfield (after year 2109; see Maps 4-27, 4-28 and 4-29 in the Hydrology TR) would not induce more ground-water recharge and, consequently, would not decrease streamflow in these rivers.

Comment. Would there be a significant impact to ground-water users in the Dakota Sandstone aquifer in Colorado due to the wellfield for NMGS (Alternative 1 water supply source)? If so, how does PNM propose to mitigate the future injury? (251.)

Response. As shown on Map 4-29 of the Hydrology TR ("Maximum Calculated Drawdowns due to NMGS in the Dakota Sandstone Aquifer"), significant impacts (maximum drawdowns of approximately 25 to 50 feet) would occur in the Dakota Sandstone in Colorado. These maximum drawdowns would not occur until after year 2109. As shown on Map F-7 (Appendix F of Hydrology TR), significant impacts (drawdown of 25 feet) to ground-water users in the Dakota Sandstone due to Baseline users in New Mexico plus NMGS would just reach the Colorado State line in year 2030.

Potential mitigation measures are discussed in Section 8.B.2 of the Hydrology TR. PNM has not committed to any of these mitigation measures at present.

Comment. The U.S. Department of the Army, Corps of Engineers, Albuquerque District, has reviewed the DEIS on NMGS to determine whether or not the DEIS is adequate to fulfill the NEPA requirements of Section 404 of the Clean Water Act. The Corps of Engineers is a cooperating agency in the preparation of the subject DEIS. The letter from the Albuquerque District summarizing their review comments stated that the DEIS does not adequately address the known and potential impacts of constructing and operating the NMGS that deal with hydrology. Specifically, a foreseeable direct impact of the NMGS is "raising the 100-year water surface by more than one foot or inducing flooding on adjacent lands." These subjects should be analyzed and their significance should be discussed. (252, 505.)

Response. In response to this comment, the text has been revised on FEIS pp. 3-37 and 3-40. These changes discuss and clarify the potential for, and impacts of, induced flooding at the proposed and alternative intake locations.

Comment. According to data presented in the Hydrology TR, pumping the wellfield for NMGS (Alternative 1 water supply source) would lower the potentionmetric surface of the Westwater Canyon Member, the Dakota Sandstone, and the Entrada Sandstone. This drawdown may also reduce the flow of springs on the Jicarilla Apache Reservation whose source is the Dakota Sandstone. Because of leakage along faults and structural features crossing aquifer boundaries, the Jicarilla Apache Tribe is concerned that the large drawdowns may adversely impact wells tapping formations stratigraphically above the Westwater Canyon Member aquifer. (269.)

Response. Based on the state geologic map of New Mexico (Dane and Bachman 1965), the Dakota Sandstone does not outcrop on the Jicarilla Apache Reservation. Therefore, it is not conceivable that springs issuing from the Dakota Sandstone on the reservation could be affected by the NMGS wellfield. The Dakota Sandstone outcrops east of the Jicarilla Apache Reservation and east of the San Juan Basin in the Chama Platform. There, the Dakota Sandstone occurs in outcrops that for the most part are discontinuous with the same unit in the San Juan Basin due to erosion.

The EIS and Hydrology TR discusses the fact that use of the wellfield would result in drawdowns in the Dakota Sandstone in the San Juan Structural Basin that are significant (greater than 25 feet). This unit lies stratigraphically above the Westwater Canyon Member. The state geologic map (Dane and Bachman 1965) shows no major faults that occur on the Jicarilla Apache Reservation in the San Juan Structural Basin. It is possible that minor faults and/or fractures are associated with the monoclinal fold that forms the northeastern boundary of the San Juan Structural Basin. It is unlikely that these fractures are vertically continuous between the Westwater Canyon Member aquifer system (Entrada Sandstone, Westwater Canyon Member, and Dakota Sandstone aquifers) and overlying stratigraphic units because of fairly widespread beds of bentonite that occur particularly near the top and base of the Graneros Shale Member of the Mancos Shale, which conformably overlies the Dakota Sandstone in the eastern part of the San Juan Basin. Bentonite is a clay mineral that swells when wet, and beds (geologic units) composed of bentonite have very low permeability. Any incipient fractures in the bentonite most likely would swell shut in the presence of water, thereby precluding vertical hydraulic connection of any significance between the Dakota Sandstone (Westwater Canyon Member aquifer system) and the units that stratigraphically overlie it.

Comment. Several comments stated that water issues for the possible New Town should be discussed in more detail. It is estimated that 4500 ac-ft/yr of ground water from the Morrison Formation would be needed for the possible New Town water supply. The cumulative impacts of groundwater pumping for NMGS and the Possible New Town should be mentioned. (269, 484.)

Response. Water use and the resulting environmental consequences for the possible New Town were not analyzed in detail in the DEIS because the possible New Town is not part of the NMGS proposal. The need for the possible New Town has not been established at this time. Given the high level of uncertainty that the possible New Town would ever be developed, the EIS does not assess potential impacts in detail.

As was discussed on DEIS p. I-2, the annual projected water use for the possible New Town during a peak year (20,000 residents) is estimated at 4550 ac-ft/yr (200 gallons per person per day).

Comment. Would streamflow reductions of 48 cfs (Proposed Action) and 28 cfs (Alternative 1) in the San Juan River downstream of the intake structure (DEIS Table 1-8) decrease recharge to aquifers hydraulically connected to the river?. (478.)

Response. The alluvial aquifer in and adjacent to the channel of the San Juan River may be recharged by flow in the river, especially during high-flow stages. Changes in the flow characteristics of the San Juan River could affect this recharge mechanism. However, a reduction of 48 cfs represents less than 3 percent of the average annual discharge of the San Juan River at Farmington (1825 cfs from 1962 to 1981) and would represent an even smaller percentage of high-flow stages. Changes of these magnitudes are not considered to be significant.

Temporary decreases in recharge to the alluvial aquifer along the San Juan River may occur during construction because of river diversion facilities that may be required to construct the intake structure. Although these potential impacts may be significant, they would be of limited duration and would occur only during the construction of the intake structure and river diversion site.

Bedrock aquifers would not be affected by the diversion of water from the San Juan

River for NMGS, because the river is a ground-water discharge area for these "bedrock" (Tertiary age and older) aquifers.

Comment. Several commenters expressed concern about the effects of the use of 15,000 ac-ft/yr of ground water from wells that would be completed in the Westwater Canyon Member of the Morrison Formation (Alternative 1 water source) on the availability of ground water to other users in the affected area. Specifically, some comments stated that the effects on the ground-water supply of the Navajo Reservation, Jicarilla Apache Reservation, and other Indian ground-water users (Crownpoint water supply; springs in Chuska Mountains) should be addressed specifically in the EIS. Indian tribes have gone on record at the January 1983 hearings on the DEIS and elsewhere with strong concerns about effects on their ground-water users. The effects of the wellfield could have an economic impact on existing and proposed developments of the Navajo Tribe. The EIS should consider future plans for ground-water use by Indian communities.

Other commenters expressed concern that use of the wellfield for NMGS may cause aquifers to dip below "critical levels," may "dehydrate the whole land in a large area," and may "drastically deplete" the ground water on the Navajo Reservation. (75, 161, 169, 194, 269, 365, 428, 441, 444, 484, 491, 496, 511.)

Response. The impacts due to use of the wellfield (Alternative 1 water supply source) for NMGS on Indian ground-water users have not been discussed separately in the EIS from other ground-water users in the San Juan Structural Basin. However, these impacts have been considered fully, as discussed in the Hydrology TR. The parts of this analysis that pertain to Indian ground-water users and specific impacts to Indian ground-water users are now summarized on FEIS p. 3-33.

Comment. The statement on p. 5-12 of the Hydrology TR, "The only conceivable hydrological effect on ground-water users from construction and/or operation of plant facilities ...would be from changes in the characteristics of flow in De-na-zin Wash" (Section 5.B.2, first paragraph), needs to be clarified. This statement needs to define two terms: ground-water users and characteristics of flow. (478.)

Response. The next sentence of the subject paragraph on p. 5-12 of the Hydrology TR states, "This streamflow may provide recharge to the ground-water flow system in the vicinity of the plant site." Significant amounts of recharge to aquifers in the Pictured Cliffs Sandstone and the Cliff House Sandstone probably do not take place through percolation of runoff in the channels of De-na-zin Wash and its tributaries in the vicinity of the plant site. De-na-zin Wash most likely provides recharge to the alluvial aquifer in the vicinity of the channel of the wash.

The nearest ground-water user is a hand-dug well completed in alluvium that is located in Section 14 (T23N, R13W) just west of the plant site. Given the relatively small thickness of alluvium and variable water quality, additional future uses of the alluvial aquifer are not expected to increase.

Characteristics of flow include the average flow volume and peak discharges. As discussed in Sections 5.C.2 and 5.C.3 of the Hydrology TR, changes in these flow characteristics would not be significant. Therefore, changes in recharge to the alluvial aquifers or effects on ground-water users in De-na-zin Wash in the vicinity of the plant site are not anticipated.

Comment. The sentence in the "Hydrology" section on DEIS p. 2-30 that reads, "Estimates of the availability of water based on the institutional limitations of the Colorado River Compact, Upper Colorado River Basin Compact, and Mexican Treaty of 1944 are 647,000 ac-ft/yr (Bureau of Reclamation)...." should be reworded to avoid implying that the Bureau of Reclamation has interpreted the Colorado River Compact. (478.)

Response. See FEIS p. 2-31 in response to this comment.

Comment. In the last paragraph in the "Hydrology" section on DEIS p. 2-30, a sentence reads, "In operation studies of the San

Juan River system, the Bureau of Reclamation estimated the physical availability of the supply upstream of Shiprock, New Mexico, to be 705,000 ac-ft/yr during a drought period." This statement needs to be further substantiated. (478.)

Response. Operations studies of the San Juan River system in New Mexico were conducted by the Southwest Region of the Bureau of Reclamation to estimate the physically available water supply that could be diverted from the San Juan River utilizing the storage capacity of Navajo Reservoir for the period 1929-1974. The period used for these studies includes the critical period (August 1952 to October 1956).

"These studies showed that all the demands could be met from the system for all of the studies. The maximum depletion was 705,000 ac-ft/yr. Enough additional water was available in Navajo Reservoir to provide for additional releases of 120,000 ac-ft/yr during the critical period" (U.S. Bureau of Reclamation, 1981b, p.3).

The full citation of the document referenced above is found on DEIS p. D-31 (Appendix D).

Comment. The New Mexico Bureau of Mines and Mineral Resources (NMBM&MR) stated that the "BLM and its contractors failed to utilize available geologic data and interpretive resources of state agencies in general, and the NMBM&MR in particular. This lack of communication and utilization of available state agency expertise resulted in inadeuacies of the submitted documents." Dr. William J. Stone of the NMBM&MR is cited as an example. Specific criticisms about DEIS Map 3-2 are raised. (478.)

Response. Attempts in 1978 to obtain interpretive information from Dr. Stone prior to their publication were unsuccessful. BLM was informed that this information would eventually be published by the NMBM&MR as Hydrologic Report No. 6 ("Hydrogeology and Water Resources of the San Juan Basin, Northwest New Mexico"). On December 15, 1981, it was stated that the report would be published in February 1982, and on May 3, 1982, it was stated that the report would be published in June or July, 1982. Dr. Stone's consultation was sought on several occasions during NMGS EIS preparation, but he was out of the United States during most of the period when the hydrologic evaluations for NMGS were being performed. Among the information which proved very useful in the development of a hydrogeologic model of the San Juan Structural Basin was Stone and Mizell (1978).

In answer to specific comments on Map 3-2:

(1a.) The drawdown contours are incredibly uniform. Is the aquifer that uniform?

The Westwater Canyon Member aquifer is realistically not that uniform, but aquifer parameters were assumed to have relatively small variations over large distances (see Map 4-17, Hydrology TR). Upon closer examination, the contours of drawdown in Map 3-2 are asymmetrical along an axis that trends generally southwest-northeast.

(1b.) Aren't there any other withdrawals during this period?

Other withdrawals are discussed in detail in Section 4 of the Hydrology TR. The drawdowns due to these "baseline" withdrawals are shown (for Westwater Canyon Member aquifer) in Maps 4-22, 4-23, and 4-25 of the Hydrology TR.

(1c.) What year do the contours represent?

The contours on Map 3-2 are maximum drawdowns in the Westwater Canyon Member due to NMGS. Maximum drawdowns occur at different times at different locations. The years in which the maximum drawdown occurs are indicated by the gray shading on the map.

2. The drawdown values seem excessive based on our work (Lyford and others, 1980).

(a) For a withdrawal from uranium mines of 2,000,000 ac-ft [sic] we

predict a maximum drawdown at Farmington of 100' by the year 2000.

(b) For a withdrawal of 15,000 ac-ft to year 2038 (if I read map right), they get 200' drawdown.

The wellfield for NMGS (Alternative 1 water supply source) would be located farther north in the San Juan Structural Basin than most of the uranium mines, which accounts for the greater drawdown at Farmington due to NMGS than due to the uranium mines (Lyford and others, 1980). For the uranium mine withdrawals simulated as Baseline projects in the NMGS EIS, between 25 and 50 feet of drawdown in the Westwater Canyon Member aquifer at Farmington is predicted in year 2030 (see Map 4-25, Hydrology TR). The ground-water withdrawals by uranium mines that were part of the NMGS baseline reached a maximum of about 40,000 ac-ft/yr; whereas, the medium-range projections of Lyford and others (1980) of ground-water pumpage for uranium mining was approximately 79,000 ac-ft/yr.

Comment. The Gallup-Navajo Indian Water Supply Project was not included among the potential San Juan River users based on the "rather arbitrary basis" that no ROW applications had been filed with the BLM as of June, 1981 (cutoff date of BLM Baseline 1 and Baseline 2 projects). However, the New Mexico Interstate Stream Commission has committed 8000 ac-ft/yr to this project (City of Gallup). (484.)

Response. The Gallup-Navajo Indian Water Supply Project did not meet the criteria for consideration as one of the Baseline 1 or Baseline 2 projects. For a project that does not presently exist or is not under development, the project must have been formally proposed and have been undergoing environmental review (see Appendix C) by June 1, 1981 to be considered as a Baseline 1 or Baseline 2 project. The Gallup-Navajo Indian Water Supply Project did not satisfy these criteria in full.

The Gallup-Navajo Indian Water Supply Project is discussed on pp. 3-25 and 3-26 of the Hydrology TR, which states that the New Mexico Interstate Stream Commission has made a tentative commitment to hold 7500 ac-ft/yr (rounded to 8000) of the Navajo Reservoir supply for the City of Gallup, pending completion of feasibility studies. The Interstate Stream Commission has not yet considered the question of an additional commitment to the Gallup-Navajo Indian Water Supply Project. The Bureau of Reclamation has reserved 24,000 ac-ft/yr of Navajo Reservoir water for the Gallup-Navajo Project.

Comment. "Extensive multigenerational replacement plans" would be required under New Mexico water law to avoid the impairment of others' water rights in the San Juan Underground Water Basin, such as the water users at Crownpoint and at the springs in the Chuska Mountains. The DEIS does not discuss how these replacement plans would affect the water use for NMGS. (437, 484.)

Response. The discussion of impairment has been expanded in the FEIS, p. 3-33.

Comment. The magnitude of flood flows in De-na-zin Wash should be discussed. No discussion of USGS data on flood flows in this wash can be found. (484.)

Response. A detailed analysis of flood flows in De-na-zin Wash and the floodplain associated with a 500-year recurrence interval flood event in the vicinity of the NMGS plant site was conducted as part of the EIS and is discussed in Section 5.0 of the Hydrology TR. The streamflow characteristics of De-na-zin Wash are summarized in Section 5.B.1.b, which includes a discussion of streamflow data collected since 1975 by the USGS at the gaging station near Bisti Trading Post (located near the northwest corner of the plant site).

Simulation of flood flows indicated that no project facilities would be located in the 500-year floodplain. Since significant impacts from flooding would not occur, a discussion of De-na-zin Wash more detailed than that presented on DEIS p. 2-9 was not necessary under CEQ guidelines.

Comment. What are the "unspecified industrial uses" to which PNM wants to devote

the other 25,000 ac-ft/yr of ground water, and for which Paragon Resources, Inc. (PNM) has applied to the State Engineer for a permit to appropriate 40,000 ac-ft/yr from the San Juan Underground Water Basin? (484, 533.)

Response. Paragon Resources, Inc. submitted an application for a permit to appropriate 40,000 ac-ft/yr of ground water from the San Juan Underground Water Basin to the New Mexico State Engineer Office on March 30, 1977. The Alternative 1 water supply source for NMGS consists in part of using 15,000 ac-ft/yr of water based on this application by pumping 16 wells that are completed in the Westwater Canyon Member of Morrison Formation. The other uses of water discussed in Paragon Resources' application are unspecified domestic, agricultural, and industrial uses in conjunction with a mine-mouth power plant and leases (1961) held by Western Coal Company (Sunbelt Mining Co.) in Townships 22, 23, and 24 North, Ranges 12 and 13 West.

Comment. What are the springs in the Chuska Mountains, which may be affected by use of the wellfield (Alternative 1 water supply source) for NMGS, used for? What quantitative effects on the springs are expected? (496.)

Response. Based on a worst-case analysis, the reduction of flow in the springs in the Chuska Mountains in the vicinity of Crystal would be a maximum of 0.4 cfs (maximum would occur in the year 2033), which is equal to the increased inflow (recharge) to the Westwater Canyon Member aquifer caused by use of the wellfield. Although average daily flow data on these springs are not available, this impact on the springs is assumed to be significant (greater than or equal to 15 percent of average daily flow).

The springs in the vicinity of Crystal are used principally for domestic water supply and also for stock watering. The main community water system obtains its water from an infiltration gallery installed in the alluvium of Coyote Wash; some of the creek flow most likely is derived from springs. Five other spring systems in the vicinity of Crystal have been developed for use by groups of Navajo homes ("camps") in the area. In addition, about three springs are impounded for livestock watering. Approximately 90 percent of the population in the vicinity of Crystal get their water from the community system, while the remaining 10 percent get their water from the camp systems (Jim Hopson, U.S. Public Health Service, Fort Defiance, Arizona, personal communication with J. Gilman of Woodward-Clyde Consultants, June 8, 1983).

The effects of use of the wellfield for NMGS on the springs in the Crystal area are discussed in more detail on pp. 4-108, 4-116, and 4-117 of the Hydrology TR. The possible effects do not include impacts to commercial timber.

Comment. The "indicators of significance" for ground water should reflect acceptable economic effects as well as acceptable amounts and kinds of change that would affect prior users' water supplies. A 25-foot water level decline, for example, probably would not affect an industrial well with several hundred feet of available head as severely as it would affect a stock well with only 25 feet of water in the well. (519.)

Response. In the light of the effects of drawdown on stock wells that might be flowing wells and not of large enough diameter to accommodate a pump if they should stop flowing, the smallest value of drawdown that could reliably be predicted by the model of the Westwater Canyon Member Aquifer System (25 feet) was selected as the indicator of significance for impacts on groundwater users.

Comment. The ground-water withdrawals used by the Westwater Canyon Member aquifer system model (Tables 4-7 through 4-11, Hydrology TR) do not appear to be consistent with the actual data (TR, Tables E-1 through E-4). A few examples of the apparent inconsistencies during the pre-1980 period (Table 4-8) are given below (533.):

(a) What are the City of Gallup withdrawals?

(b) Where in Table E-1 is the information supporting the values used for the Mariano Lake mine and the Ambrosia Lake Area mines?

(c) Were the withdrawals from the Dakota Sandstone modeled for the pre-1980 period?

Response. There are inconsistencies between the water use estimates presented in Tables E-1 through E-4 and the actual ground-water withdrawals simulated by the model. These inconsistencies are a result of the uncertainties in water use data, because of lack of information slowdown in the uranium mining industry, and other factors. These uncertainties are discussed in detail on pp. 4-48 and 4-49 of the Hydrology TR. In particular, for the historic water uses presented in Table E-1, there are gaps in the years in which water use was reported in several cases. In other cases, values of water use reported by two different authors are not in agreement. Interpolation of the available data, therefore, is required to construct a continuous estimate of historic ground-water use by a particular user for input into the ground-water model.

The City of Gallup withdrawals were inadvertently omitted from Table 4-8. Changes are provided in the Changes to the Text section for Table 4-8 to present the omitted data and to provide other corrections for this table.

The information supporting the values used for the Mariano Lake Mine are found at the top of p. E-4 in Appendix E of the Hydrology TR. The information supporting the Ambrosia Lake area mines are found on pp. E-4 and E-5. The information on the Ambrosia Lake area mines was sparse and not well documented. Therefore, constant-head values were used to simulate the influence of the uranium mines, as discussed in footnote 4 on Table 4-8 of the Hydrology TR.

As stated on p. 4-46 of the Hydrology TR, only ground-water users who use more than 100 ac-ft/yr were considered to be significant for impact analysis. Smaller users (less than 100 ac-ft/yr) were not tabulated, and ground-water withdrawals less than 0.1 cfs (72.4 ac-ft/yr) were not simulated in the model. No ground-water users with production greater than 0.1 cfs from the Dakota Sandstone aquifer were identified. Where wells are completed in both the Westwater Canyon Member aquifer and the Dakota Sandstone, most of the ground-water production was assumed to be from the Westwater Canyon Member.

Water Quality

Comment. A number of commenters expressed a concern about the relationship between water quality at the site and waste disposal activities. (17, 90, 136, 302, 428, 437, 444.)

Response. A substantial amount of discussion is presented in the Water Quality TR regarding the relationship between both ground- and surface-water quality at or near the site and waste disposal activities (see Water Quality TR, pp. 5-24 to 5-50). The conclusion of these discussions is that, while waste disposal activities have the potential to substantially degrade ground- and surface-water quality near the power plant site, mitigation measures are available to limit potential impacts (DEIS p. 3-54, pp. 8-1 to 8-4 of the Water Quality TR). The exact procedures for limiting potential impacts have not yet been selected and would not be selected.

Comment. A number of commenters expressed a concern about the relationship between increased consumption of ground or surface waters of the NMGS and possible New Town and the quality of remaining ground and surface waters. Several commenters wanted more quantitative data on the nature and extent of these water quality impacts. (115, 316, 437, 449, 458, 478, 496, 498, 505.)

Response. The increased use of ground and/or surface waters would lead to small decreases in the water quality of the San Juan River downstream of the diversion facility, and of the Westwater Canyon Member in the immediate vicinity of the wellfield. The Water Quality TR contains quantitative and qualitative discussions on

the water quality effects of the water supply system (see pp. 3-14 through 3-25 and pp. 4-12 through 4-14).

Comment. The representation of the nearest well in the DEIS shows that there would be some treatment required to bring the deep ground water from about 6 times more salt than drinking water standards would allow, about 4500 milligrams per liter total dissolved solids, to drinkable and plant cooling water. (136.)

Response. If Westwater Canyon Member ground water were used at the possible New Town, treatment of the water would be required before the water could be used for human consumption.

Comment. The water quality monitoring plans listed in the Suggested Mitigation section are not specific enough. (226, 473, 478.)

Response. Specific monitoring programs for the evaporation and coal-runoff ponds, solid waste disposal area and surface-water discharges would have to be submitted to and accepted by the NMEID before the waste discharge plan for the facility could be approved. This approval would be sought in conjunction with the New Mexico Water Quality Control Act (NMSA 1978). (See DEIS, p. F-3.)

Comment. On July 22, 1982, the Corps of Engineers stated that: revised regulations for Sections 404 of the Clean Water Act (33 CFR 320-330) were published in the Federal Register. There were some changes to nationwide permits for the discharge of dredged or fill materials into waters of the United States, some of which are pertinent to the proposed work. Construction of the proposed pipeline crossings and transmission line crossings may be performed under the nationwide permit for utility lines. However, if temporary structures are to be constructed using material other than that excavated from the trench, an individual Section 404 permit would be required. Discharges into waters above the headwaters may be made under the nationwide permit for discharges into certain waters. There are also nationwide permits for minor road crossings and discharges less than 10 cubic yards. No reports or statements of intent are required to use nationwide permits. The only requirement is that the person responsible for the project assures compliance with all conditions of the permit. An individual permit would still be required for the intake structure. (252.)

Response. Changes are provided in the Changes to the Text section for p. 3-14 of the Water Quality TR in response to the above-mentioned revised regulations for Section 404 of the Clean Water Act (33 CFR 320-370).

Comment. Insufficient information about the design of the wastewater disposal facilities was presented in order to evaluate their potential water quality effects. (136, 437, 484.)

Response. Operation of the wastewater disposal facilities would not be permitted until a discharge plan for these facilities has been approved by the EID, in accordance with EPA's regulations. The detailed design information required for approval of the waste discharge plan would not be prepared until approval of the waste discharge plan is required. As noted in the Water Quality TR, this approval is not required until 120 days after the initiation of waste water discharges.

Comment. In the preparation of the Water Quality TR, Woodward-Clyde Consultants, and hence the BLM, have ignored a substantial body of technical work compiled by the EPA regarding the mining, combustion, and disposal of wastes associated with western U.S. and San Juan Basin coal deposits. This is a major omission and should be rectified. A brief bibliography of these reports follows:

Cook, Frank, Mathematics, Inc., 1979. Evaluation of the environmental effects of western surface coal mining: U.S. Environmental Protection Agency, Industrial Environmental Research Laboratory, Cincinnati, Ohio, 137 p. EPA-600/7-79-110.

Everett, L.G., ed., General Electric Company-TEMPO, 1979. Ground-water quality monitoring of western coal strip mining: identification and priority ranking of potential pollution sources: U.S. Environmental

Protection Agency, Interagency Energy-Environment Research and Development Program Report, Environmental Monitoring and Support Laboratory, Las Vegas, Nevada, 239 p. EPA-600/7-79-024

Gold, H., D.J. Goldstein, R.F. Probstein, J.S. Shen, and D. Yung, 1977. Water requirements for steam-electric power generation and synthetic fuel plants in the western United States: U.S. Environmental Protection Agency, Office of Energy, Minerals and Industry, Washington, D.C., 259 p. EPA-600/ 7-77-015.

Jones, D.C., W.S. Clark, J.C. Lacy, W.F. Holland and E.D. Sethness, 1977. Monitoring environmental impacts of the coal and oil shale industries, research and development needs: U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Las Vegas, Nevada, 193 p. EPA-600/ 7-77-015.

Lee, Hong, T.O. Peyton, R.V. Steele, R.K. White, 1977. Potential radiopollutants resulting from expanded energy programs: U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Las Vegas, Nevada, 130 p. EPA-600/ 7-77-082.

Libicki, Jacek, 1978. Effects of the disposal of coal waste and ashes in open pits: U.S. Environmental Protection Agency, Industrial Environmental Research Laboratory, Cincinnati, Ohio, 282 p. EPA-600/ 7-78-067.

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Response. The cited references have been reviewed. In general, the water quality concerns discussed in these references have been covered in the Water Quality TR. The need for operational monitoring and the potential effects of solid waste disposal were explicitly covered in the Water Quality TR. A specific water quality monitoring plan was not proposed in the Water Quality TR; this plan would be submitted by PNM to EID in the course of the EID's review and approval of the discharge plan for the facility. One water quality concern mentioned in the cited references, but not explicitly mentioned in the Water Quality TR, is the potential migration of radionuclides away from the fly ash disposal area. Potential radionuclide migration was not mentioned because it is not a problem at the site. As was mentioned in the Water Quality TR, the rate and quantity of ground water moving through the fly ash disposal site is expected to be very small. Because the rate of contaminant transport away from the fly ash disposal site is dependent upon the rate of water movement, the movement of contaminants away from the site is expected to be very slow. The potential for radionuclides to move away from the plant would be even less because radionuclides movement through underground strata tends to be much slower than most other water quality constituents, such as total dissolved solids, sulfate, chloride, etc.

Comment. The Water Quality TR states that the total quantity of unplanned discharges from the power plant could not exceed 365 tons per year. The commenter felt that any unplanned discharges are unacceptable. Another commenter felt that the quantity of discharge should be predicted so that alternative management plans (such as excess evaporation pond capacity) could be designed to mitigate potential water quality impacts. (437, 478.)

Response. A discharge plan for any unplanned discharges from the power plant would have to be approved by the NMEID within 120 days after the discharge is initiated, in accordance with the EPA's regulations. The NMEID, at the time of the approval of this discharge plan, would make the determination as to what level of discharge, if any, is acceptable and would at this time be able to determine if additional mitigation measures are required.

Comment. The withdrawals of large amounts of ground water from the Westwater Canyon aquifer system (12,850 ac-ft/yr to 17,500 ac-ft/yr for mining, plus a possible additional 15,000 ac-ft/yr for power plant make-up water under the NMGS alternative plan) are expected to cause the aquifer conditions to change from artesian to unconfined conditions. It is acknowledged that this would allow the entry of lower quality water into the Westwater Canyon Member from the overlying Dakota Sandstone. This would constitute a degradation of water quality in the Westwater Canyon Member. (437.)

Response. It is estimated that increases of this magnitude would not substantially affect the sole purpose use (i.e., the power plant) of Westwater Canyon Member ground water in the immediate vicinity of the wellfield. As noted in the DEIS (p. 3-28) some leakage into the adjacent aquifers (that is, the Entrada and Dakota Sandstones) would occur as a result of power plant wellfield pumping. The greatest leakage is expected to occur in the immediate vicinity of the wellfield. Because the quality of water found in the Entrada and Dakota Sandstones is generally higher in total desolved solids (TDS) than that found in the Westwater Canyon Member, the TDS of ground water in the Westwater Canyon Member in the immediate vicinity of the wellfield would increase as much as 5 percent (see p. 4-14 of the Water Quality TR).

Comment. No specific plans or restrictions on the discharge of hydrostatic pipeline test waters, or on the disposal of drilling mud associated with drilling and testing of water supply wells have been presented. (437, 478.)

Response. Approval for the discharge of hydrostatic pipeline test waters and drilling muds would have to be obtained from the EPA and/or the NMEID. The EPA Region VI office in Dallas, Texas requires that an application for a discharge permit be sent to its office 180 days in advance of a discharge to surface waters. A notice of waste discharge would have to be filed with the EID if these waste waters would be discharged into dry arroyos or ephemeral streams so that it may move directly or indirectly into ground waters with a TDS of 10,000 mg/l or less. A discharge plan from the NMEID may be required. Detailed discharge plans for these discharges would be submitted to these agencies in order to obtain the required approvals.

Comment. On the subject of water quality, the DEIS seems to downplay the fact that the construction and operation of NMGS would detrimentally affect the character of the San Juan River. Increased suspended sediment loads, additional dissolved solids and the probability of fuel, oil, and solvent spills are just some of the potential threats to the river. Likewise, non-point source pollution of water may occur from the generating stations stack emissions, possibly contributing to acid precipitation. (458.)

Response. The potential impacts on the water quality of the San Juan River are extensively covered on pp. 3-14 to 3-25 of the Water Quality TR. Suggested mitigation measures designed to limit San Juan River water quality impacts are listed on p. 8-1 of the Water Quality TR and the unavoidable adverse impacts of the proposed project on water quality in the San Juan River are listed on p. 9-1 of the Water Quality TR. Because of the high efficiency of the particulate removal equipment at the power plant, downwind deposition of particulate material would be minimal, thus limiting potential non-point source water. For the gases like SO_x and NO_x, see the Air Quality section of this FEIS for a discussion of the potential for the plant to cause acid precipitation.

Comment. Table 5-3 of the Water Quality TR should include the 86 toxic pollutants as specified in Section 1-101 U4 of the New Mexico Standards as amended through September 20, 1982. (478.)

Response. Changes are provided in the Changes to the Text section for Table 5-3 of the Water Quality TR to include the 86 toxic pollutants.

Comment. Page 5-40 of the Water Quality TR states that the Shomaker Report showed the maximum rate of alluvial ground-water flow was calculated as 3.3 ft/yr. This is incorrect, because the report calculated the "Darcy Velocity" which should be divided by the effective porosity of the material to yield the actual rate of water movement. As an example, if the effective porosity was 0.1, a reasonable value, then the actual rate of ground-water movement would be 33 feet per year. (478.)

Response. The maximum ground-water velocity mentioned on p. 5-40 of the Water Quality TR slightly underestimates the actual maximum ground-water velocity that was measured for local alluvial aquifer material. The maximum value of 3.3 ft/yr should be increased somewhat by dividing the effective porosity of the aquifer material through which the ground water is moving. The likely water-bearing and -transmitting materials in PNM Well A-3 (for which the calculation on p. 5-40 was made) are described in the Shomaker Report as coarse-grain sands. Effective porosities of coarse-grain sands generally range from 0.20 to 0.35 and average about 0.27 (Barouch, M. 1971. Evaluation of the ground-water storage capacity in the super creek sub-basin using the physical parameter approach. Ontario Water Resources Commission Water Resources Report 4). Using this average value of 0.27, the estimated maximum velocity of ground water in the alluvial material would be about 12 ft/yr. This value would be about four times greater than that originally estimated in the Water Quality TR.

Changes are provided in the Changes to the Text section for p. 5-40 of the Water Quality TR in response to this comment and recalculation. In conclusion, the maximum net movement of alluvial ground water is still extremely small, even after adjustment. This slow movement of ground water lends itself to monitoring and control activities, should any ground-water contamination occur.

Comment. None of the wells listed in Table 5-4 (pp. 5-13 and 5-14) of the Water Quality TR have been completed properly to obtain a representative sample of alluvial water. All other wells are of questionable value, since they are perforated in both the alluvium and the Pictured Cliffs Sandstone. Thus, the TR does not adequately describe the quality of alluvial water. (478.)

Response. All of the wells listed in Table 5-4 (and pp. 5-13 and 5-14) of the Water Quality TR are perforated in the alluvium. However, the perforations in the casings of these wells are extended down below the alluvial materials into underlying materials. Because of the limited water yielding capabilities of the underlying materials, it was presumed that almost all of the water removed from these wells was derived from the alluvial materials. However, the possibility that underlying materials also contribute water to these wells can not be ruled out. Consequently, when the EID reviews the discharge plan submitted to them for approval (this discharge plan must contain a detailed plan for monitoring including design and location specifications for monitoring wells), they should keep in mind that these wells may also collect ground water from materials underlying the alluvial materials. However, the water quality results listed in Table 5-4 of the Water Quality TR are still useful, as these results can be compared against future water quality results to determine if water quality changes have occurred.

Comment. The design capacity for the coal pile runoff ponds should contain a precipitation event larger than the 24-hour 10-year event. The estimated life of the ponds is 40 years, so it appears that the ponds would overflow approximately four times over their lifetimes. (478.)

Response. The federal New Source Performance Standards (NSPS) for new coal-fired generating stations state that coal-pile runoff ponds are only required to their discharge limitations for storms less than the 10-year, 24-hour events. For storms producing greater rainfall than the 10-year, 24-hour event, the federal NSPS allow the utility to discharge the extra water without

treatment. Consequently, the design capacity chosen for the coal-pile runoff pond meets federal standards. One of the reasons the federal NSPS allows discharge of coal-pile runoff during a large rainfall event is that the quality of coal-pile runoff varies with time such that the storm runoff from the coal-pile during the first few minutes of the storm would be relatively contaminated and that produced during the later parts of the storm would be relatively uncontaminated. Consequently, the quality of runoff occurring from a storm larger than a 10-year, 24-hour storm would probably be relatively high quality water and would have little or no effect on downstream surface- or ground- water quality.

In addition, the present conceptual design for the NMGS water management systems allows water collected in the coal-pile runoff pond to be recycled back into the water management system. If this recycling occurs, rainfall from a storm larger than the 10-year, 24-hour storm would not have to be discharged.

Comment. On p. 5-38 of the Water Quality TR the discussion on the coal-pile runoff states that the levels of dissolved solids are low; however it doesn't point out the extremely high levels of arsenic and selenium resulting from leaching experiments (Table 5-13). For coal 131, the arsenic and selenium concentrations exceed the New Mexico standards by a factor of 134 and 920, respectively. How do these results apply? (478.)

Response. The quality of leachate from two New Mexico coals are listed in Table 5-13, p. 5-39 of the Water Quality TR. The arsenic and selenium contents of leachate from one coal were very high, while the arsenic and selenium content of leachate from the other coal were extremely low, much lower than New Mexico standards. These results indicate that the quality of leachate from coal-piles can vary tremendously, especially in the concentrations of such trace elements as arsenic and selenium. Consequently, it would be important for PNM to do extensive leachate testing to determine the variability of these constituents in leachate from their coal. If coal-pile runoff from PNM's coal is found to have high levels of arsenic and selenium, the NMEID may want to limit the discharge of these waters. The conceptual water and waste water management plan already allows water from the coal-pile runoff pond to be recycled back to the water management system.

Comment. Since most of the alluvial ground water is associated with ephemeral surface waters, Map 5-1, p. 5-12 of the Water Quality TR, would be more useful if it had surface water drainages drawn on it. (478.)

Response. The purpose of this map was to locate the wells in relation to potential sites for solid waste disposal. Because the existing topography would be drastically changed after mining and subsequent solid waste disposal activities, the identification of existing drainages would not be that useful.

Comment. Page 2-12 of the DEIS states that the quality of water in ephemeral channels near the generating station site is, after settling, adequate for most beneficial uses. Given that "beneficial" appears to be used in a generalized, non-legal sense, what is meant by this statement? How is or would the water be used? Further, would the quality of these waters be degraded and the use or uses impaired if wastewater is discharged to De-na-zin Wash during upset or off-design conditions or as a result of other project actions? (478.)

Response. In a non-legal sense, the surface water occasionally found in De-na-zin Wash below the power plant site could be beneficially used, based on its water quality, for such uses as irrigation, stockwatering, and industrial use. From a legal point of view, the water occasionally flowing down De-na-zin Wash below the power plant site is not presently used, nor is it expected that it would be used, because flow in De-na-zin Wash occurs infrequently. The power plant would be designed and operated as a zero-discharge facility; consequently, no discharges to downstream water courses would occur. If, after the plant becomes operational, it becomes evident that a discharge to De-na-zin Wash would be necessary, the appropriate permits from the EPA and the NMEID would be requested. Know-

ledge about the quality and quantity of the liquid requiring discharge would be available at that time.

Comment. Table 1-1 on p. 1-5 of the DEIS does not clearly show that a discharge plan would be required for the power plant facilities at NMGS. (478.)

Response. Table 1-1 on p. 1-5 of the DEIS does not show that a discharge plan is required for the power plant. However, the need for approval of an EID discharge plan for the power plant facilities was stated on p. 3-55 of the DEIS and on pp. 5-35, 5-40, 8-3, and 8-4 of the Water Quality TR.

Comment. Page 2-30 of the DEIS discusses "designated beneficial uses." Under New Mexico law certain legal criteria must be met for a use to be considered a "beneficial use." As actual diversion of water is one criterion, in-stream flows may be beneficial, but are not beneficial uses. Designated uses, on the other hand, are water uses that the stream standards are designated to protect. Designated uses are existing uses or, if the the use is still to be attained, may be desired uses. Therefore, while beneficial use implies that water is actually being used for specific purposes, a designated use may be a water quality goal rather than a description of actual uses. (478.)

Response. Changes are provided on FEIS p. 2-31 in response to this comment.

Comments. No distinction is made between a standard and what is simply recommended criteria. Criteria are guidelines and, while being generally true, may be wrong in specific instances. The EPA is therefore encouraging states to develop site specific standards.

While the DEIS says that exceedances of standards and criteria were considered to be significant, they are not discussed or tabulated elsewhere in the DEIS. In fact, the discussion on pp. 3-10 and 3-11 of the TR merely describes general levels and exceedances and does not draw any conclusions regarding significance. The discussion is not always supported by the data given in Table 3-1.

Please note that Section 1-102.I of the General Standards included in the New Mexico Water Quality Control Commission water quality standards, must be considered when evaluating the significance of temperature changes.

What is the relevance of the water quality and possible uses of the San Juan River and its tributaries to the construction and operation of the project? With the significant exception of salinity, would the project affect the water quality of this river system or result in changes of the use of this water? What is the purpose of the discussion given between pp. 3-1 and 3-11 of the TR? (478.)

Response. For the purposes of this EIS, no distinction has to be made between water quality standards and recommended water quality criteria because both of these measures of water quality were included in the definition of the indicators of significance for water quality.

The discussion on pp. 3-10 and 3-11 of the Water Quality TR refers to existing San Juan River water quality. Indicators of significance, on the other hand, refer to changes in San Juan River water quality brought about by the proposed project. These were applied in the analysis and the findings are discussed on pp. 3-13 and 3-14 with the finding of no significant impacts.

Section I-102 of the general standards was noted but does not apply to the power plant because no thermal discharges are expected.

Pages 3-1 through 3-11 of the Water Quality TR provide background data on the uses and present quality of the San Juan River and its major tributaries. This information is useful in evaluating the effects of water withdrawal and construction of in-stream diversion facilities as well as providing a general overview of the surface-water quality characteristics in the general area. In addition, the tabular presentation of water quality standards and criteria was used later on in evaluating other surface water bodies.

Comment. While the text reference on p. 3-1 of the Water Quality TR is correct, Appendix A is incorrectly titled. These are not the complete New Mexico Water Quality Standards. Specific standards for the San Juan Water Quality Basin in New Mexico are summarized in the incorrectly titled and labeled Table 3-2 on p. 3-4. The title should refer to designated (not beneficial) uses and the water quality standards for a specific stream segment consist of designated uses and numeric criteria, not of numeric criteria alone. (478.)

Response. Changes are provided in the Changes to the Text section for Water Quality TR Table 3-2, p. 3-4, and for the title of Appendix A in response to this comment.

Comment. Many of the wells in Tables 5-4, 5-6, 5-7, and 5-8 of the Water Quality TR are not identified on Map 5-1 entitled "Location of PNM and other wells at which water quality data are available." All of these wells should be shown on this map. (478.)

Response. Seventeen of the 23 wells listed in Tables 5-4, 5-6, 5-7, and 5-8 are identified on Map 5-1. The locations of the remaining six wells are listed in Tables 5-6 and 5-8.

Comment. On p. 3-8 of the Water Quality TR, it is stated, in connection with numeric salinity criteria for the Colorado River, that salinity is not specifically regulated in the San Juan River in New Mexico. The statement confuses standards, which are guidelines for pollution control, with regulations. As is noted correctly later in the TR, saline discharges from point sources are regulated through the federal NPDES permit program. Moreover, the state of New Mexico can and does use Section 102.K of its general water quality standards in placing conditions into and certifying NPDES permits in accordance with Section 301(b)(1)(A) of the federal Clean Water Act. (478.)

Response. Changes are provided in the Changes to the Text section for the first full sentence in the first full paragraph on p. 3-8 of the Water Quality TR in response to this comment.

Comment. Table 5-5, p. 5-16 of the Water Quality TR shows phenols exceed the New Mexico standards for all of the wells, yet on p. 5-15 of the report it states "on occasion, concentrations of phenols may exceed the New Mexico Water Quality Control Commission's Ground Water Standard." Examining the Shomaker (1980) report, only A-2, A-4, and PC-2 exceed the standard, while wells A-5 and A-7 were not analyzed. These inconsistencies should be clarified. (478.)

Response. These discrepancies result from the fact that Table 5-5 on p. 5-16 of the TR was derived from the 1981 PNM publication "Bisti Water Monitoring Program Annual Report" summarizing ground-water quality monitoring at the site from June 1979 to December 1980. The 1980 Shomaker Report contains phenol analyses for only one sample from each well during April 1979. The 1981 PNM monitoring report contains phenol analyses of at least six samples from each well. Concentrations of phenol over the New Mexico Standard were measured in all of these wells during the June 1979 to December 1980 period.

Comment. "The discussion of water issues for the possible New Town (I-2, III-2) is scanty in the extreme. 4500 acre feet of water from the Morrison are estimated to be needed; this water will have to be treated to remove dissolved solids and waste waters. Wastewater would have to be treated and discharged with unknown impact on users of shallow ground water in the downstream drainage (p. III-2)." (484.)

Response. If a New Town proposal becomes feasible, the applicant would have to comply with all EPA regulations in force at that time. In the meantime, no specific plans for the treatment and/or disposal of wastewaters resulting from the possible New Town development have been proposed. Consequently, it is too early to predict an impact which may never materialize. It may well be proposed that lined and well-monitored evaporation ponds be used for disposal of water softening wastes and non-treated wastewater would be used for irrigation. In this case, the downstream water quality effect would be minimal.

Comment. "Solid and liquid wastes from the plant, and their characteristics can be only broadly categorized at this time" (B-3). In fact, these wastes are only alluded to in a few scattered paragraphs of Appendix B. Zero discharge is PNM's "objective," but if this cannot be maintained, PNM will file a discharge plan. No discussion is given of what PNM would discharge under any conditions, including the worst-case conditions required by the regulations (1502.22(b)). The San Juan Plant was proposed to have no routine discharges when it submitted a discharge plan to the state in 1980, but is now accused of polluting arroyos and wells with salts from scrubber waste discharges (Albuquerque Tribune, 3-23-83, P.D.). (484.)

Response. As noted above, PNM proposes to design this facility for zero-discharge of waste water. While PNM's zero-discharge plan has not proceeded beyond the conceptual stage, other western utilities have proven that the zero-discharge concept can be implemented (see the Water Quality TR, p. 5-30). Although the water management system is planned to be zero-discharge, a worst-case estimate (365 tons of TDS per year) of the total amount of material discharged into De-na-zin Wash per year was given (see the Water Quality TR, p. 5-34).

Comment. On p. 3-31, it states that the Bureau of Reclamation views the TDS increase (4 mg/l at Imperial Dam, resulting from diversion of the San Juan) as an allowable result of each state's right and use of available Colorado River water. This position is totally responsive to the law, but it should not discourage government/industry efforts to mitigate the salinity impacts where waters of degraded quality can be used to conserve fresh water supplies. (505.)

Response. The McElmo Creek unit of the Colorado River Quality Improvement Program (CRWQIP) was investigated as a possible source of water supply but was rejected from further consideration because of water rights constraints.

Comment. In conducting an assessment of the water supply for the "Possible New Town," the quality of the available groundwater supplies from the different underlying aquifer formations should be compared with applicable criteria and standards to determine if compliance with the National Interim Primary Drinking Water Regulations would be economically possible with treatment. (169.)

Response. The economic feasibility of water system designs for a new town would undoubtedly be evaluated at the time of any specific project description development. Generally, the ground-water quality associated with the wellfield formation sources are of sufficiently good quality as to not preclude treatment to municipal-use standards.

Comment. There are state ground-water protection rules which are not mentioned in any of the impact documents. (136.)

Response. Several permits related to water use and quality would be required for the NMGS proposal. These were identified in the DEIS (pp. 1-4 to 1-7 and F-1 to F-3).

Comment. According to the DEIS, withdrawal of up to 35,000 ac-ft of water from the San Juan River would increase average levels of TDS downstream along the Colorado River. While the Bureau of Reclamation views these TDS increases as an allowable result of the State's use of available Colorado System waters, the significance of TDS increases in downstream waters and the Imperial Dam from unplanned discharges during high rainfall conditions from onsite ponds should be discussed. In this discussion, please consider separately the effects from using the proposed action water supply system and the alternative water supply whose waters differ in TDS concentrations and possibly in other parameters. (169.)

Response. Some discussion has been presented in the Water Quality TR about the potential downstream water quality effects of discharges if the proposed zero-discharge system does not prove to be completely effective all of the time. It was noted in this discussion that if a discharge from the facility were required, the discharge would be regulated under an NPDES permit issued by the U.S. EPA. Under this permit system, the U.S. EPA has been limiting dischargers to a maximum TDS discharge of 365 tons per

year. If it is assumed that this maximum amount of TDS is actually discharged, the effect on downstream waters would represent 0.05 percent of the annual discharge of TDS of the San Juan River at Shiprock. The effect would be even smaller farther downstream (see p. 5-25 of the Water Quality TR).

Comment. It should be indicated if the two proposed EVAP ponds, the effluent ponds, and the storm drainage and coal pile runoff ponds would be located outside the influence of the floodplain of the Coal Creek/De-na-zin Wash and any other tributary or drainage course and what efforts would be taken to prevent any discharge from these ponds to downstream water during high rainfall conditions. (169.)

Response. As shown in Map 5-1 on p. 5-5 of the Hydrology TR, the two proposed EVAP ponds, the effluent ponds and the storm drainage and coal pile runoff ponds would be located outside the influence of the floodplain of Coal Creek and De-na-zin Wash. The plant will be designed as a zero-discharge facility; consequently, no surface water discharges are expected during either high rainfall or low or no rainfall periods. The minimum federal requirement on the discharge from the coal pile runoff pond is that it contain rainfall from events smaller than the 10-year, 24-hour event.

Comment. In addition to the pollutants listed on p. 3-55 of the DEIS, composite samples should be tested for all pollutants that may exceed the numerical standards listed in Part 3 of the New Mexico Water Quality Control Commission. The DEIS does not clearly show a discharge plan will be required by the state. (478.)

Response. In accordance with U.S. EPA requirements, specific monitoring plans for the evaporation and coal-runoff ponds, solid waste disposal area, and potential surface water discharges would have to be submitted to and accepted by the New Mexico Environmental Improvement Division (EID) before the waste discharge plan for the facility could be approved. Consequently, the EID will have the opportunity and responsibility to require that composite samples should be analyzed for all pollutants that may exceed the numerical standards listed in Part 3 of the New Mexico Water Quality Control Commission Regulations.

Vegetation

Comment. Where is there a discussion of impacts to livestock grazing? What are the impacts to livestock grazing? (98.)

Response. The affected environment for livestock grazing is described on pp. 2-12 and 2-43 of the DEIS. See changes on FEIS pp. 3-15 and 3-38 in response to this comment: Additional discussion concerning impacts to livestock grazing and estimates of economic loss due to project facilities is contained in the Vegetation TR on pp. 4-7, 4-23, and 4-51 through 4-54.

Comment. Disturbance of riparian vegetation should be minimized during construction of the San Juan River diversion structure, and any disturbed areas should be revegetated. (433.)

Response. This committment has been made by the applicant as stated on DEIS p. 1-29.

Comment. The design and operation of the intake diversion structure could cause bank erosion or require additional flood protection and therefore result in additional disturbance of riparian vegetation.

Impacts could be mitigated by preventing unnecessary losses of riparian vegetation and revegetation with riparian species. (433.)

Response. The potential for impacts due to bank erosion is considered low and is therefore not discussed on p. 3-32 of the Project Description TR. The potential for these impacts is considered low because, as stated on p. 3-8:

- The intake would be protected by concrete headgates.
- The bank along the diversion facility would be rip-rapped.
- Back eddies and sandbars would be prevented by dispersing or transporting sediments in the settling chambers.

At this time, it is not known if additional flood protection up or downstream would be

required. See FEIS Changes to the Text section for DEIS p. 3-32 to discuss potential impacts to riparian vegetation associated with additional flood protection. If the need for additional flood protection up or downstream of the diversion facility becomes necessary and existing riparian vegetation is disturbed, revegetation of any disturbed areas with riparian species would be attempted.

Comment. The study area for suggested monitoring studies of soil and water chemistry (in order to measure the potential for acid rain impacts) should be expanded from high mountain areas northeast of NMGS to include the Jemez Mountains in north central New Mexico. (433.)

Response. See FEIS p. 3-38.

Comment. Water drawdown in the San Juan Basin would affect the saline lowland vegetation type over time.

The impact of water withdrawal from the San Juan River would be detrimental to cottonwoods and would restrict cottonwood regeneration. (478.)

Response. It is unlikely that saline lowland vegetation would be affected since surface impacts from any drawdown in San Juan Basin ground water would be limited to very small decreases in discharge to surface streams and creeks (refer to p. 3-30 of the DEIS and Hydrology TR for modeled discharge rates). These small changes in discharges would not affect saline lowland vegetation.

As discussed on p. 3-32 of the DEIS and p. 4-13 of the Vegetation TR, a reduction of 1.3 percent of peak flows would probably not result in restriction of riparian or cottonwood regeneration. Seedlings of many riparian trees and shrubs (including cottonwoods) can only establish on freshly deposited mud and sand of channel and point bars created and modified by peak flows. A reduction of 1.3 percent of peak flow is not likely to alter this process.

Comment. Would there be compensation for cropland and surface disturbance incurred if pipeline P_1 or P_2 is the selected alternative, or any compensation to the Navajo Indian Irrigation Project? (194.)

Response. There would be no effects to NIIP lands from P_1 because P_1 would be located within the existing highway rights-of-way. The choice of alternative pipeline corridor P_2 would involve temporarily disturbing about 97 acres of land that is irrigated in the NIIP, but this would involve little crop loss if it were done during the winter. If annual cropland were disturbed, essentially no production would be lost. Disturbance of perennial crops (i.e., alfalfa) would involve a 1-year production loss of 97 acres while the crop reestablishes.

Any compensation resulting from selection of P_2 would be negotiated between the applicant (PNM), the Division of Land Development, Navajo Tribe and Navajo Agricultural Products, Inc.

Comment. Two plants, Astragalus knightii and Penstemon parviflorus, of recent concern to the New Mexico Heritage Program may be present in the project area. (478.)

Response. These two plants are hereby included in the FEIS as special status plants.

Comment. Further field studies are needed along proposed ROW and project site locations for rare plants. (478.)

Response. PNM has committed to conducting surveys for special status plants most likely affected by surface disturbances such as pipeline and transmission line construction, as stated on DEIS p. 1-29. Areas of potential habitat would be surveyed for federally threatened, endangered and candidate species and plants recommended by the BLM or other land managing agencies for survey. In compliance with the Endangered Species Act, BLM would include as stipulations to the ROW Grant any surveys required resulting from formal section 7 consultation with the U.S. Fish and Wildlife Service for federally listed threatened or endangered species.

PNM has conducted surveys for the federally listed endangered Mesa Verde cactus in the vicinity of the NMGS reservoir and

possible New Town sites with negative results. The Mesa Verde cactus is the only federally listed species potentially occurring in those areas.

Comment. All of the area to be disturbed by the actions addressed in this EIS should be surveyed by qualified personnel for special status plants instead of the "...areas of potential habitat for special status plants indicated to be most likely affected by the project." Such inventories must be carried out by trained plant taxonomists who have extensive backgrounds in special status plants. Detailed studies such as these are absolutely required because of the lack of knowledge about the special status plants, the habitats with which they are associated, and their distribution in any particular area. The New Mexico Department of Natural Resources, Natural Heritage Program, has accomplished some excellent work on special status plants under the direction of Paul Knight, and it is strongly suggested that he be directly involved in developing the above program. (532.)

Response. The applicant has committed to conduct surveys for special status plants. The BLM (Farmington Resource Area) is developing criteria including: surveyor qualifications, and BLM approval of a survey plan which would be required for future surveys. Assistance from the New Mexico Heritage Program would be welcome.

Comment. How can the BLM adequately comply with the regulatory mandates to serve a 2-year notification to permittees who will lose grazing preference when permittees are not even known? (478.)

Response. BLM will comply with all regulatory mandates for livestock grazing administration including section 402(g) of the Federal Land Policy and Management Act of 1976 and applicable federal codes and regulations.

Wildlife and Aquatic Biology

Comment. Two comments inquired about what criteria were used to determine which species were included as special status species in the Wildlife TR. Specifically, commenters asked that additional state-listed species, national species of special emphasis, and species of concern in regard to the potential impacts of surface coal mining be included.

In addition, confusion was expressed about why the peregrine falcon (federally listed) and mountain plover were addressed in the Wildlife TR. (244, 536.)

Response. The criteria used to determine which state-listed species were included in the Wildlife TR were:

1) Those species recommended by NM Game and Fish Department during drafting of the TR.

2) Those species that occur in the geographic area of influence and which could be susceptible to potential project impacts, including acid rain.

Concerning the Volume 47, No. 176, Federal Register listing as stated on p. 39891 "...the designation of national species of special emphasis is solely for internal planning and budgetary purposes of the Service (FWS) and does not create any regulation of the species." As a cooperating agency, FWS has not recommended that BLM give special consideration to this listing nor the "list of species that are of concern in regard to the impacts of surface coal mining."

The peregrine falcon was not listed by FWS in their initial listing of threatened, endangered and candidate species (FWS Dec. 1, 1981). As a result, it was included in the Wildlife TR. It was then added to the list by FWS on Sept. 1, 1982, as a result of BLM's request for a list update based on potential acid precipitation effects. The peregrine falcon now also appears in the Threatened and Endangered Species TR.

The mountain plover was recommended for consideration by BLM's Farmington Resource Area and FWS early in the process. This species is listed as a "Migratory Bird of High Federal Interest" under DOI's "Coal Unsuitability Criteria" (Title 43 CFR 3461.1) for Federal Coal Leasing.

Comment. The acres of mule deer winter range lost to the project is 36, while Table

1-8 indicates only 35 acres would be lost. These impacts should also be discussed in the text of the environmental consequences chapter of the EIS. (252.)

Response. Table 1-8 indicates that 35 acres would be removed at the intake site and an additional acre along pipeline P1. This totals the 36 acres referred to.

Impacts to mule deer crucial winter range are discussed in the TR for Wildlife on pp. 4-14, 4-21, and 5-1. The CEQ Regulations reguire that impacts should be discussed commensurate with their potential significance. These impacts were not discussed in the text of the DEIS because they were not considered significant.

Comment. Use of water from the Navajo Reservation and San Juan River could have impacts to the Navajo Reservoir and the quality stream fishery reach of the San Juan River greater than those indicated in the DEIS. (266.)

Response. Increases in stocking could be necessary to maintain a fishery, and the quality of the fishery could decline. See changes on FEIS p. 3-39 in response to this comment.

Comment. No mention is made of nonendangered aquatic resources that occur in high mountain lakes and streams of New Mexico and Colorado. Coldwater fisheries in these states are important recreation resources and the potential for acid precipitation impacts should be addressed. (433.)

Response. The probability of occurrence and potential magnitude of acid precipitation impacts to aquatic species in high mountain aquatic habitat cannot be quantified. The potential for these impacts would be similar to that discussed for threatened and endangered species on DEIS pp. 3-15 and 3-16. The types of impacts would also be the same as discussed for threatened and endangered species, and could include sublethal effects such as inhibition of larval development or direct mortality.

See changes on FEIS p. 3-17 in response to this comment.

Comment. Review of DEIS Chapters 1 through 3 revealed a need for several additional fish and wildlife resource recommendations:

1. The employee information program (p. 1-30) could be expanded to include information on protected wildlife species and illegal shooting. Additionally, the program could provide information to employees about sensitive wildlife species and prevention of unnecessary human disturbance.

2. Public affairs personnel could provide information on hunting and fishing opportunities and advise employees to use less-crowded areas (p. 1-30).

3. The NMGS storage reservoir offers a unique opportunity to create a sport fishe Creation of a public fishing area at NMGS may divert some projected future use from present fishing areas. In any event, PNM should regulate public use of the reservoir area to prevent illegal shooting of waterfowl and shorebirds.

4. Page 3-55 discusses potential water quality monitoring. Evaporation ponds and liquid waste discharge pits should be monitored for bird and small mammal mortality. If losses occur, remedial measures such as screens or fences should be constructed to prevent continued losses. (433.)

Response. See changes on FEIS p. 3-68 in response to this comment.

Comment. The importance of riparian and wetland habitats for wildlife species, particularly migratory waterfowl and passerine birds, should be discussed. (433.)

Response. See changes on FEIS p. 2-38 to clarify the importance of riparian and wetland habitats.

Comment. The discussion indicates 2400 acres of non-game wildlife habitat would be

removed at NMGS. Wildlife habitat at NMGS is not uniquely different from surrounding habitat; however, vegetation at NMGS does support dove and quail, which are considered game species (see pp. 3-12 and 3-13, Wildlife and Aquatic Biology TR). (433.)

Response. Pages 3-12 and 3-13 of the Wildlife and Aquatic TR indicate that populations of dove and quail are low and do not support any appreciable level of hunting. The habitat at NMGS is therefore considered primarily nongame habitat. Changes are provided on FEIS p. 3-16 in response to this comment.

Comment. A listing of four criteria is given under "indicators of significance" in the Wildlife TR, whereas in the main body of the report the approaches to wildlife are either by species or by group. This is confusing and creates doubt that all the criteria are actually represented by examples. (536.)

Response. As described on p. 2-2 of the Wildlife TR, the categories of species discussed under the heading "unique" or "highly valued" are included because they are characterized by one or more of the four criteria.

It should be noted that all of the criteria may not and were not intended to be represented by examples, but that each species present in the geographic area of influence that met one or more criteria did receive analysis.

Comment. The discussions in the Wildlife TR on "Other Wildlife Species" are limited in scope. More attention should be given to such wildlife, especially those meeting criteria 2, 3, and/or 4 under "Indicators of Significance." A notable category that might be expanded is peripheral species. (536.)

Response. "Other Wildlife" by definition (Wildlife and Aquatic Biology TR, p. 2-3, lines 3-8) are those species that do not meet one of the four criteria on p. 2-2. See Changes to the Text section for Wildlife TR p. 3-1 to clarify this.

The discussion of other wildlife has been intentionally limited because these species are not considered significant as defined by the criteria on p. 2-2 nor are they capable of rapid recovery and repopulation of disturbed areas. The discussion of "Other Wildlife" has thus been limited and referenced to other reports where possible.

Comment. As far as the study area is concerned, the montane vole, spotted owl, downy woodpecker, smooth green snake, and bullfrogs are not typical of ponderosa pine/oak/ pinyon pine woodlands. In fact, some of these species are not known to occur in the study area.

Species such as the red-headed woodpecker and Baird's sparrow are extremely rare in the study area and should not be given as examples of birds occurring here in shrubland/ grassland habitats. In fact, these are not the habitat of the woodpecker, nor of the ring-necked pheasant. The woodpecker and sparrow are state-endangered species that are not otherwise discussed in the report.

Poor or incorrect examples of species of juniper savannas/pinyon-juniper woodlands are goshawk, peregrine falcon, merlin, band-tailed pigeon, spotted owl, and downy woodpecker. (536.)

Response. The possible presence of these species are all documented in the references cited on the Wildlife TR p. 303. Thank you for these specific clarifications.

Comment. The statement is in error that "Koster (1957) did not report... (the red shiner) as occurring in New Mexico...." He did report it in New Mexico but not in the San Juan River--where it has been present since at least 1964. (536.)

Response. Changes are provided in the Changes to the Text section for the Wildlife TR, p. 3-28, in response to this comment.

Comment. The indicated plan of increased stocking of fish in the quality waters is not a viable one in view of the New Mexico Game and Fish Commission's planned regulations or the number and size of fish to be insti- tuted in 1983. (1, 477.)

Response. For the 2.75-mile portion of the San Juan River below Navajo Dam, the trend

is to reduced bag limit and increased size limit with restrictions on bait fishing. Other parts of the river are not similarly restricted. Any manipulation of fish stocking would be through and by the New Mexico Department of Game and Fish.

Comment. The EIS contains statements that various project components could affect raptor nests in the area. The BLM should acknowledge the role of the USFWS in raptor protection and encourage consultation to delineate buffer zones, develop mitigation, and issue special "take" permits where appropriate. (532.)

Response. Avoidance of construction through areas with nesting raptors was included as suggested mitigation on DEIS p. 3-57. Areas to be avoided and dates would be included as stipulations to the ROW grant once a centerline has been located and site-specific information can be generated. Raptor specialists including those within the USFWS, would be consulted to assess site-specific impacts and determine appropriate mitigation.

Comment. The EIS should include a discussion of how the transmission line towers will be safe for raptors and consider using nest platforms on some towers to enchance raptor nesting. (532.)

Response. Transmission line towers, conductors, and spacing of lines would be designed to preclude the electrocution of raptors, including species with the largest wingspans, such as bald and golden eagles (p. 4-23 of the Wildlife TR). Potential impacts due to the collisions with towers or lines are discussed on pp. 4-33 and 4-24 of the Wildlife TR.

Because no centerline has been surveyed by the applicant, it is not possible to accurately predict impacts to raptor nests in the vicinity of ROWs. When a final centerline is surveyed, the BLM would assess the potential for impact to individual raptor nests and stipulate appropriate mitigation. Construction of nest platforms on some towers would be one of several mitigation measures that would be considered.

Comment. The BLM should describe how intake design will minimize losses due to impingement and entrainment. (532.)

Response. Intake design is discussed in the Project Description TR and Wildlife and Aquatic TR on p. 4-18. Traveling screens would prevent larger fish from entrainment. A certain percentage of entrained organisms would survive and reproduce in the reservoir.

Comment. Will the final design of the water pipeline act as a barrier to wildlife movement? It is not clear whether the pipe will be elevated above ground. (532.)

Response. The pipeline would not act as a barrier to wildlife since the pipeline will be underground.

Comment. Summary of impacts on wildlife should touch on more of the impacts expected, specifically:

- Human-related disturbances, such as road kills, poaching, indiscriminate shooting, harassment, etc.

- The greater loss of wildlife habitats due to housing and service facility construction.

(532.)

Response. The impacts anticipated from human disturbance and increased human presence were discussed on p. 3-15 of the DEIS and in the Wildlife TR. These are summarized on p. S-8, second column, first full paragraph.

Comment. The BLM has not put the 48-cfs reduction in the San Juan River flow in the proper perspective. The EIS downplays the reduction by comparing it to peak flows. Since the aquatic communities below the intake location depend on minimum flows, the 48-cfs loss must be related to those crucial periods. (532.)

Response. As was discussed on p. 3-32 of the DEIS and in the Hydrology TR, there would not be a net reduction of 48 cfs below the intake structure during minimum flows

because the 48 cfs required for NMGS would be released from Navajo Reservoir specifically for NMGS. Therefore minimum flows and aquatic communities below the intake would not be affected.

Comment. On p. 1-29 it is stated that disturbed areas within ROWs will be revegetated with vegetation recommended by wildlife specialists. The first responsibility of the reclamation or revegetation effort should be to stop or limit all offsite impacts from the action described commensurate with stopping all soil erosion. If this primary goal can be accomplished utilizing plant species valuable for wildlife forage, it would be excellent, providing those species fit with the land use planning goals developed for the area. The first characteristics by which plant species would have to be selected would be their ability to establish an "effective and permanent vegetative cover." (532.)

Response. This is correct. Vegetation recommended for revegetation would be selected based on a number of factors, including the ability to establish a diverse, effective, and permanent vegetative cover. See changes on FEIS p. 1-31 in response to this comment.

Comment. To effectively protect the soils resource, reestablish vegetation, and control soil erosion, applicant-committed practices should be more specific than described. Detailed soil and vegetation inventories of rights-of-way and plant site should be accomplished after final selection of routes. Suitabilities for topsoil use of soils materials and reclamation planning should be determined from detailed inventories. Trenches should not be cut directly downslope but should be constructed across slope. (532.)

Response. It is standard BLM procedure to include details for reclamation, erosion control, and revegetation as stipulations to a ROW grant. These stipulations would be based on site-specific analysis after a final centerline is surveyed and prior to construction. Stipulations would include site-specific recommendations for such issues as erosion control, reclamation, and revegetation.

Threatened and Endangered Species

Comment. Two comments stated that all available information on threatened and endangered (T/E) species was not collected or utilized in the impact assessment. (9, 444.)

Response. The staffs of the two commenting agencies (Navajo Tribe Game and Fish Program, and BIA Navajo Area Director) were contacted several times for information on T/E species (see NMSO contact files). Subsequent contacts have been made upon receipt of these comments to solicit further information. This information has been discussed and considered. The Biological Assessment (Appendix H) discusses the differing interpretations of the validity of available data.

Comment. A 100-percent coverage survey for black-footed ferrets should be conducted along the transmission line and pipeline ROW, possible New Town site, proposed plant site and proposed water storage sites. These surveys should be conducted by qualified personnel; that is, personnel who have had experience with black-footed ferrets and have trained in the most recent ferret survey techniques. Although the last reported ferret sightings for this area are 20-years old, we feel these surveys are needed in light of the recent events in Wyoming. (242, 244.)

Response. Pipeline and transmission line corridors were not surveyed for prairie dogs. The only potential habitat identified for black-footed ferrets (indicated by the presence of prairie dog towns using existing data) was along transmission line T_2 and water pipeline P_3.

BLM determined that the black-footed ferret would not be affected by the proposed action or alternatives (Threatened and Endangered Species TR and Biological Assessment). Potential habitat for this species (prairie dog towns) does not exist on the "Bistilands" (NMGS site, possible New Town site, grazing lands) under consideration as part of the proposed Ute Mountain Land Exchange (Berger 1981). Potential habitat does exist on T_2 and P_1, but the black-footed ferret is not expected to be affected by those linear features and the short-term

duration of project impacts. BLM would not require surveys for this species primarily as a result of the lack of recent confirmed evidence of the occurrence of this species in the project area, and limited impacts to potential habitat.

Comment. Several comments requested changes in the "no effect" finding for the black-footed ferret based on varying agency opinions of the validity of commonly held and other data. These comments also requested clarification of the status of field surveys for habitat (prairie dog towns) for black-footed ferrets. (242, 244, 433, 444, 503, 536.)

Response. Differing interpretations of the validity of available data for the affected environment is discussed in the Biological Assessment (Appendix H). However, the finding of "no effect" to the black-footed ferret from the NMGS and Ute Mountain Land Exchange proposals or alternatives will remain the same as stated in the DEIS.

The "no effect" finding has been concurred with in informal consultations with FWS Region 2 staff. At the same time, it is true that the FWS is no longer considering declaring this species extinct in New Mexico (Stegman, 1983), and references to Hansen (1981a) have been deleted in the Biological Assessment. This document also includes mention of the Wyoming population of this species that is being rigorously studied.

The "no effect" finding is primarily based on recent field work conducted for this and related proposals. Field work was conducted on the NMGS site, possible New Town site, wellfield components, and grazing lands subject to possible exchange. No potential habitat for this species was found (Berger 1981). Review of secondary data was conducted for all the transmission and pipeline alternatives with the conclusion that habitat for this species does exist for T_2 and P_1. Nevertheless, the "no effect" finding was judged valid on the basis that short-term, fast-paced construction activities would not impact the black-footed ferret, especially in view of the lack of recent irrefutably confirmed sitings of the species in the area potentially affected by the proposals. Impacts from operation of these linear facilities were, likewise, found to not affect the species since the amount of surface disturbance is very narrow in any given area. Furthermore, recent observations suggest that prairie dog towns emerge in disturbed areas more readily than adjacent areas which are undisturbed.

Comment. Several comments sought clarification of surveys for rare plants with emphasis on the Mesa Verde cactus. (242, 244, 433, 444, 478, 532.)

Response. Field surveys for Mesa Verde cactus have been completed for the NMGS plant site and alternative reservoir sites (PNM 1981, 1982). No plants were located. Furthermore, the applicant has committed to conduct surveys for special status plants (including federally listed or candidate threatened and endangered species, if they are indicated by BLM or FWS) to be likely affected by the project. Such surveys would be conducted upon agencies' final approval of a centerline survey, that would be conducted at a time nearer to construction activities, if authorized. Further details regarding locations of potential habitat was given on DEIS pp. 2-15, 2-17, 2-43, and 2-44 and Threatened and Endangered Species TR pp. 3-13. Available information on potential habitat indicates that this cactus may be present on alternative pipelines P_1, P_2, and P_3 and transmission lines T_1, T_2, T_3, T_4 and T_5. Consequently, the EIS has stated a "may affect" finding for the Mesa Verde cactus.

Comment. The discussion on impacts to endangered species is inadequate, particularly as it was limited to narrowly-defined geographic areas. The Jicarilla Reservation supports several protected species including bald and golden eagles and peregrine falcons which may suffer if the proposed actions are undertaken. These adverse effects would not be a direct result of construction activities but rather would occur as the increased population those activities bring to the area encroach upon the animals' habitats. Concern was expressed that BLM studies failed to adequately address area-wide impacts on such species from potential chronic exposure to pollutants generated by the proposed

projects. Such exposure may be either direct or indirect through the food chain or habitat reduction. (269.)

Response. Analysis of impacts to threatened and endangered species was not limited to the immediate vicinity of project components. On pp. 2-12 and 2-13 of the DEIS it was explained that the geographic areas of study included:

1) in and adjacent to areas where increased recreation, e.g., hunting and fishing, or other human uses may occur;

2) in the generalized areas of high-elevation aquatic habitat where acid precipitation could occur.

Based on these considerations, the list of T/E species analyzed included species with distributions that ranged over the majority of northern and central New Mexico and Colorado. All of the species mentioned were included in the analysis. The concern for indirect impacts to species because of "increased human populations and resultant encroachment on species' habitats and chronic exposure to pollutants generated by the proposed project" is valid. An attempt was made to discuss these impacts in a qualitative manner, since quantification of these impacts was not possible. Refer to pp. 3-15 and 3-16 of the DEIS for a discussion of potential indirect impacts such as:

- greater hunting and fishing pressure
- other human related disturbances
- chronic exposure to pollutants such as acid precipitation

Specific impact areas could not be identified, but the generic impact discussion would apply to the Jicarilla Reservation as well as other locations within the geographic area of influence. (Refer to pp. 3-1 through 3-19 of the Threatened and Endangered Species TR for additional discussion of impacts.) BLM will complete formal Section 7 consultation with the FWS as required by the Endangered Species Act of 1973 for all federally-listed species which may be affected.

Comment. Two comments recommended a change in the finding of "no effect" to the endangered bald eagle to the finding of "may affect." (433, 503, 536.)

Response. The BLM concurs. This change has been made in the Biological Assessment (see Appendix H) which has been submitted to the FWS.

Comment. Clarification was requested about the status of the BLM's consultation with the FWS in reference to the Endangered Species Act Section T. (433, 503, 505, 532.)

Response. The BLM has informally consulted with FWS on numerous occasions throughout the environmental process, through meetings, phone calls and reviews of all threatened and endangered species related work (see files, NMSO BLM). The Threatened and Endangered Species TR was used as a basis for drafting a Biological Assessment (see Appendix H) for submittal to the FWS (see Appendix H). Formal consultation under the ESA has been initiated and a Biological Opinion from FWS is anticipated. One change in findings from the TR is reflected in the Biological Assessment for the bald eagle. The finding has changed from "no effect" to "may affect." The Biological Assessment reflects additional data and comments resulting from the review of the DEIS and TR. Consultation will be completed following a biological opinion from FWS; however, if, during the course of any future project-related activities, any further relevant information becomes available to impinge on the FWS determination, then consultation would be reinitiated.

Comment. Two comments asked that the status of the Colorado squawfish in New Mexico be clarified. (505, 536.)

Response. Collection of the squawfish was made near Aneth, Utah, in 1978 (Minckley and Carothers 1979). Hence, this squawfish persists in the San Juan River downstream of the New Mexico-Utah border. Its recent occurrence in the New Mexico area of project influence in the San Juan River remains unconfirmed (since 1965).

Comment. You mention the New Mexico Wildlife Conservation Act here, but the only species treated in your report are those that are also federally listed. You should either

treat the purely state-listed species here as well, or indicate that they are treated elsewhere. (536.)

Response. Changes are provided in the Changes to the Text section for p. 1-15 of the Threatened and Endangered Species TR to clarify that the state-listed species are trated in a different place.

Comment. One comment letter suggested corrections for species mentioned in the TRs for Vegetation, Wildlife and Aquatic Biology, and Threatened and Endangered Species. (536.)

Response. Spelling corrections have been accepted as follows: eypha to cypha; stimous to stomias; white-tailed prairie dog to Gunnison's prairie dog; bluntnose shiner to blacknose shiner; and placita to placitus. Also, changes are provided in the Changes to the Text section for Table 3-4 (p. 3-27) of the Wildlife TR to include the Iowa darter, Etheostema exile.

Comment. Additional candidate species need to be treated in the Threatened and Endangered Species TR, especially those in the recent Notice of Review (Federal Register, Vol. 47, No.251, pp. 58454-58460, December 30, 1982). The species to be treated include the razorback sucker, Jemez Mountain salamander, white-faced ibis, Swainson's hawk, ferruginous hawk, mountain plover, western yellow-billed cuckoo, spotted bat, swift fox, and perhaps others -- particularly if acid rain effects are to be considered. (244, 536.)

Response. The species analyzed in the TR are those included on the list provided by the FWS (p. 1-15). This list has been updated by the FWS to include species that are in areas where acid rain could produce impacts. In addition, category 1 species (species likely to be federally listed as threatened, endangered or proposed) are included in the Biological Assessment.

Comment. The language relating to Hanson (1981) indicating the FWS may prepare a "Notice of Review" to declare the ferret extinct in New Mexico is inappropriate in the TR and should be omitted. Because of recent findings in Wyoming, new biological evidence describing potential black-footed ferret habitat is available and will be considered by the FWS in determination of extinction in any areas. In addition, the 1981 memorandum indicated the "Notice of Review" would be prepared and decisions would be made within a year. This has not been accomplished to date, and there are no current plans to declare the species extinct in New Mexico. (503.)

Response. The Biological Assessment (see Appendix H) has been revised to reflect FWS present position and mentions the recent findings in Wyoming.

Comment. Page 3-4, NMGS, greenback cutthroat trout. The discussion should indicate the prevailing wind direction and the higher potential for southern Colorado and northern New Mexico to sustain acid precipitation impacts. (503.)

Response. The greenback cutthroat trout is known only in certain eastern slope headwater streams and lakes in Colorado. The wind at higher altitudes of the San Juan Basin moves generally from west to east (see affected environment section of the Biological Assessment, Appendix H - bald eagle).

Comment. Page 3-5, NMGS, bald eagle. The Navajo Reservoir and the San Juan, Animas, and La Plata rivers in San Juan County, New Mexico, are major wintering areas for bald eagles. Recent data indicate these habitats are the principal wintering areas for approximately 100 bald eagles. There is potential for direct diversion of up to 35,000 acre-feet of water from the San Juan River or Navajo Reservoir, for the purpose of supplying water to NMGS. This additional diversion of water, along with other diversions, may deplete stream flows and adjacent wetlands. Additional disturbance to the eagles may result from human population growth in northwest New Mexico. Social and economic developments and recreational uses such as hunting, fishing, boating, and sightseeing will increase in proportion to increases in human populations. Impacts to Navajo Reservoir, the rivers, and their associated bald eagle habitats may occur due to flood control, water supply, housing, and transportation projects. Eagles could be affected by destruction of habitat, illegal shooting,

increased human activities, and interference with roosting or feeding patterns.

An additional consideration that was not apparent when we commented in July 1982, is the effect acid precipitation may have on the wintering areas. Several bald eagle nests occur in southwestern Colorado. Although we agree at this time that the effect of acid precipitation on the bald eagle may be quite limited, we would still have to conclude that NMGS "may affect" the bald eagle. (503.)

Response. These concerns have been addressed in the Biological Assessment (Appendix H). BLM has changed its determination of effect from "no effect" to "may affect" based in part on potential acid precipitation and human population increase pressures. BLM is complying with the Endangered Species Act by initiating formal section 7 consultation with the FWS.

Comment. Page 3-13, NMGS, Knowlton's hedgehog cactus. The potential for increased human population in the region and for increased cactus collection and recreation-related impacts should be addressed. (503.)

Response. The known populations are relatively inaccessible to the public (see Appendix H of this FEIS).

Comment. Page 4-1, Threatened and Endangered Species TR, suggested mitigation. This section should be changed to make the recommendations part of the proposed action or to consider them in the project development as conservation measures. (503.)

Response. Although this section appeared in the Threatened and Endangered Species TR, it is inappropriate for the Biological Assessment. The FWS will recommend mitigation measures, as appropriate, based on their review of the Biological Assessment in Appendix H of this FEIS.

Comment. Page 1-1, New Town, Affected Environment. We suggest this section of the draft be expanded to describe all project components of New Town. The discussion should include a description of transportation corridors, energy transmission facilities, water supply projects, sewage treatment facilities, recreation development, and likelihood for secondary effects such as increased human disturbance and off-road vehicle use. If information on these components is not currently available, the potential extent of development and potential impacts should be anticipated. The geographic area of influence should be reanalyzed and expanded to include the above components. (503.)

Response. The Biological Assessment (Appendix H) includes the possible New Town as a possible end use of the Ute Mountain Land Exchange. Under the concept of "incremental steps", BLM addressed endangered species concerns based on the best available information. A more detailed proposed action is unavailable. Should the proposal progress further, future federal actions would be involved which would entail both Endangered Species Act compliance and NEPA compliance.

Cultural Resources

Comment. Impacts to cultural resources are stated to be "unknown," and no detailed mitigation plan is provided to comply with the National Historic Preservation Act. An intensive background research and literature search must be conducted for project areas and related adjacent areas. Fuller field inventory and evaluation of cultural resources in the project area is needed, including nomination of sites to the National Register of Historic Places. (1, 128, 160, 198, 264, 389, 404, 444, 445, 449, 478, 496, 498, 505.)

Response. The National Environmental Policy Act requires an assessment of the impacts of proposed actions on presently known cultural resources, including significant prehistoric and historic sites. It does not set forth requirements for a cultural resource management or historic preservation program; that is outlined in the National Historic Preservation Act, E.O. 11593, and related regulations. The description of the applicant-committed program in cultural resource management discussed in DEIS p. 1-29 is the basis for compliance with NHPA prior to any ground disturbing project activities. BLM requires compliance with, and will exercise its responsibilities to ensure

that the program is implemented in accordance with, all applicable laws and regulations. Detailed evaluation and mitigation activities would be major aspects of this program, appropriately carried out only after engineered project designs are completed. In compliance with the intent of E.O. 11593 Sec. 2(b), and NHPA Sec. 110(a)(2), resources are presumed to be eligible for the National Register of Historic Places and managed as if eligible until they are evaluated as being ineligible for the Register.

Comment. Table 1-7 has no mention of cultural resources. (9, 431, 445.)

Response. Table 1-7 includes only those resources for which there were available valid numbers representing the quantity of resources known to be subject to adverse impacts by the proposed action. No such numbers are available for cultural resources since inventory of the proposed project areas is incomplete. The applicant committed (DEIS p. 1-29) to a cultural resource management program that would effectively avoid all significant impacts to important prehistoric and historic resources.

Comment. Specific areas and prehistoric resources that may be affected by the proposed project are either undervalued (e.g., CCNHP, Blacklake area, non-Chacoan sites) or overemphasized (e.g., Chacoan sites). Not enough emphasis is given to evaluating the impacts of the proposed action on the variation inherent in the various types of sites found within the project area. National Register of Historic Places criteria are not addressed. (128, 160, 160(a), 198, 319, 335, 355, 449, 469, 498.)

Response. The Cultural Resources TR addresses the National Register criteria, and the full temporal range of cultural resources (from Paleo-Indian through historic Navajo and contemporary religious sites) that may be affected by the proposed action. It also addresses the variable types of sites that are presently identified for each time period. Further attention to these topics is appropriate during a project compliance effort, not to the environmental analysis process.

Comment. Native American religious sites (graves and sacred sites, including medicinal and ceremonial herbs) need more detailed discussion, as well as other traditional collecting sites. What mitigation will be required to retain the values of these sites? (9, 96, 128, 404, 431, 449, 496, 534.)

Response. The Cultural Resources TR has a more detailed discussion of Native American religious and traditional cultural sites that may be affected by the proposed project. A specific mitigation program would be developed by the BLM as part of the permit stipulations. Compliance with the American Indian Religious Freedom Act would be a primary consideration in the development of this mitigation program, as is described in the Cultural Resources TR, pp. 5-1 and 5-3).

Comment. Were actual site locations plotted in relation to proposed and alternative project areas? How many have been nominated to the National Register of Historic Places? Was there an evaluation of previous archeological survey coverage? (232, 355, 445, 449, 534.)

Response. Site locations were plotted, previous survey coverage was assessed, and NRHP-listed sites were noted; see Cultural Resources TR.

Comment. The Pueblo of Sandia is concerned about proposed development near the "La Ceja" area, which is of traditional religious and cultural significance to the members of the Pueblo. (397.)

Response. As noted in the Cultural Resources Technical Report (pp. B-13, B-14), Sandia Pueblo tribal officials were interviewed to learn their concerns about the effect of the proposed NMGS on traditional religious areas and at that declined to identify any such concerns. The applicant-committed program in cultural resource management described on DEIS p. 1-29 would include a program to protect traditional

religious areas, developed in consultation with the BLM and concerned tribal officials. The Sandia Pueblo concerns would be addressed in that program.

Comment. There is a concern about the effect of acid precipitation on the archeological structures and natural overhangs in CCNHP. (168.)

Response. The issue of the effect of acid rain on prehistoric San Juan Basin sites was addressed in the Cultural Resources TR (pp. 4-3 to 4-5), and concluded that there is insufficient information available from which to evaluate the effects of acid rain versus other types of natural site deterioration (e.g., wind, rain, grazing).

Comment. The applicant should educate employees about federal laws and regulations regarding the protection of antiquities on public lands, and report violations of these to the proper authorities. (496.)

Response. The applicant is committed to the implementation of an active employee information program to build an awareness of the important archeological and other cultural values in the project area as stated on DEIS p. 1-29, and would generally comply with all applicable historic preservation legislation.

Comment. The DEIS discussion of the affected cultural resources is extremely general, and should include a more substantive discussion of those resources. (431, 498.)

Response. The Cultural Resources TR includes information about all identified resources for which records were publicly available; as noted in the TR (p. 2-28) these did not include data from the Navajo Nation Cultural Resources Management Program. Information about data recovery programs completed recently have not always been entered into the Laboratory of Anthropology data base, hence was not incorporated within the TR. Because of the unevenness of the available information no valid or reliable analyses of predicted resource distributions could be completed within the scope of a NEPA document. The applicant-committed activities would include a more intensive review of published and unpublished information about specific project areas once engineer-designed areas are established, for completion of a cultural resource management program prior to any ground-disturbing activities.

Visual Resources

Comment. The value of visual "resources," which appear to include "badlands," is highly exaggerated. These badlands have been known to most New Mexicans for many years, most are reasonably accessible, and yet there have been few visitors, mainly because these scenic badlands occur in most parts of New Mexico, including near Santa Fe and near Albuquerque.

What percentage of the taxpayers are concerned with "degrading the quality of views" from the badlands areas? Two percent? Obviously it cannot be a large number or large percentage because that would "impair the solitude"! Are these public lands for use by all of the people (or, at least for all of the taxpayers who pay the bills) or just for a favored few? (28.)

Response. The visual assessment is reflective of the value of the badlands as a nationally important resource for its scenic, educational, and scientific qualities (see the WSAs EIS). Portions of these areas (the Bisti and De-na-zin WSAs) have also been inventoried and classified by the BLM as having high-quality scenic characteristics. Since the intent of NEPA is to protect and preserve valuable resources for the use and enjoyment of future generations as well as present populations, the percent of present use is of less relevance to this issue of maintaining the integrity of this resource for the future.

Comment. Degradation of the scenic quality of the landscape and destruction of some unique geologic formations and wilderness areas would take place as a result of mining, power generation and associated activities and various ROWs. There is no commitment in the documents about if, how, and when mitigations would take place. (444.)

Response. Mitigation recommendations are made for all significant visual impacts where actions are practical, feasible, and neces-

sary. Destruction of unique geologic formations and wilderness areas was not identified in the NMGS DEIS (see SJRRCL EIS). Landscaping and use of natural and harmonious colors and materials have been recommended for reducing visual contrasts of new structures (the plant, transmission lines, and towers).

Refer to the Visual Resources TR (Section 5, mitigation recommendations) for a detailed discussion of actions. Also refer to applicant-committed practices for reducing visual contrasts (DEIS, p. 1-29).

Comment. Page 1-34, the BLM's VRM system is an effective method for analyzing visual resources if the assumption is that all lands are under the same management and of equal "importance." Unfortunately, the system does not, and cannot, factor in the relative values of scenic or visual resources seen from lands managed by other agencies which are not in multiple use. The VRM system makes no allowance for the context from which lands are seen; a viewpoint from CCNHP looking north from Pueblo Alto, following the path of the Great North Road, may not meet the VRM's narrow standards for Class I; but it is managed by the National Park Service as a significant viewpoint for its interpretive, scenic and historical values to the park. The so-called "contrast ratings" applied by the BLM do not describe the potential impacts of the visual intrusion of a transmission line corridor to CCNHP.

As stated above, the BLM's VRM system and its categories do not address National Park Service concerns for maintenance of visual integrity from CCNHP. At a minimum, the visual resources section should address the fact that transmission lines T-2 and T-3 would be visible from CCNHP and should enumerate the viewpoints from which the lines would be visually intrusive.

On p. 2-24, CCNHP certainly merits a more extensive discussion than Angel Peak or Bluewater Lake. It was established as a National Park Service area by Congress, is of national and international significance, and is a destination park for visitors in the area. Moreover, there is no discussion of the spectacular preservation of ruins of the Chacoan culture and its significance as part of one of the richest archeological districts in the world. This is an example of the "undervaluing" referred to above.

On p. 2-42, the discussion of visual resources effects of the T-2 transmission line should explicitly state that one of its major drawbacks is its proximity to CCNHP. (498.)

Response. The visual assessment of landscape changes resulting from regional actions included identifying viewing points within a 12-mile radius of the proposed plant and within 5 miles either side of alternative transmission lines. The definition of the visual resource study area included viewing points within Park Service jurisdiction and responsibility (see contrast rating form, p. C-8 of the Visual Resource TR).

The line, form, color, and texture of dominant elements in the natural landscape surrounding CCNHP were inventoried and classified by BLM as common to the geographic area and not exhibiting unusual scenic qualities, as defined by those parameters. BLM recognizes that the predominant reason for the sensitivity of the park from a visual resources perspective is for its historical and cultural values rather than its landscape features. The BLM concluded that changes to the landscape were not significant in the context of similar changes to landscapes which were more highly rated by the VRM criteria. In addition, this conclusion was reinforced by the belief that there is an existing line which can be seen from Pueblo Alto now and that the dominant views from Pueblo Pintado are in the direction of Cabezon Peak or toward the main portion of the park rather than looking away from the park to landscapes where extensive coal mining and a railroad are proposed for the same time frame. (See Cumulative Overview).

In this context too, the BLM recognizes that the visual impact of the existing 230 kV transmission line visible from Pueblo Alto is of a different magnitude with the potential visual impact of the proposed 500 kV transmission lines.

Language has been added to the text to reflect the importance and significance of Chaco Culture National Historical Park.

Maintenance of landscape integrity for historic and cultural purposes is addressed within both the recreation resources and cultural resources DEIS sections and is further discussed in the respective TRs.

Comment. Figure 3-1 gives an artist's rendition of "NMGS, North Approach." The view is actually from the west, not the north (see layout, p. 1-14. The apparent mesa to the left of the plant is not a mesa at all, but the emergency coal pile (see layout, p. 1-14). Also, the artist has chosen to portray the plant when it is not running, as evidenced by the lack of steam from the cooling towers. A more accurate and representative view should be prepared. (457.)

Response. See changes on FEIS p. 3-23, Figure 3-1 in response to this comment. Refer to Figure 1-2, "Station Layout" (DEIS p. 1-14), for identification of generating station com- ponents as depicted in the artist's sketch. Features shown in the foreground are cooling towers. Steam from the cooling towers would be visible from the view as depicted from the west. The dark-colored mass to the left of the stacks is the coal pile for the plant.

Comment. Why isn't As-shi-sle-pah listed as a visually significant point of interest in the project region? (457.)

Response. With respect to plume perceptibility, the visibility analysis conducted for NMGS examined the visibility of the plume from CCNHP, San Pedro Parks Wilderness Area, and Mesa Verde National Park. Ah-shi-sle-pah was identified as part of the affected environment for the T-2 transmission alternative in Table 2-7 ("Visual Resource Inventory Classes for Landscapes Occupied by Project Components," p. 2-19 of the DEIS). Visual contrasts are described in the TR for this section of T-2; however, the report points out that "the significance of those contrasts is minimized...because the predominant high-quality vistas in both the Ah-shi-sle-pah WSA and CCNHP sites are in directions away from where the transmission line would be located," (p. 4-8).

Comment. Refering to p. 3-22, since De-na-zin is primarily west and a bit north of the NMGS site, how can it be seen to the southwest? Also, how can the Chuskas be seen behind the plant?

Refering to p. 3-22, there is inadequate support for the statement that no part of the plant can be seen from any outliers. (498.)

Response. See Changes to the Text section for TR Map 2-1 in response to this comment. In Appendix A of the TR, a photo record on p. A-6 documents the view of the Chuska Mountain Range from the De-na-zin viewing point, and identifies the location of the proposed plant from the same viewing point recorded photographically, with a helicopter hovering over the proposed plant site. (Also refer to p. 2-11 of the TR.) Because the helicopter at a 575-foot altitude was not detectable (by the human eye or with binoculars) from either of the vantage points (Sec. 9, West Mesa, within the boundaries of CCNHP and the remote location, Pueblo Pintado) CCNHP is eliminated from the primary visual zone.

Comment. Mining and power plant construction and operation would occur within visual range of the proposed wilderness areas, and within visual range of Chaco Canyon National Monument. This is contrary to the concepts of wilderness, and dust and air pollution from the NMGS would affect the wilderness and monument environment. (437.)

Response. No part of NMGS, including the 575-foot-high stacks, would be visible from Chaco Culture National Historic Park (Visual Resource TR pp. 2-12) and because of the distance between the park and plant site "neither plume perceptibility nor visibility impairment due to plumes would be frequent or significant" (DEIS p. 3-6). Dust, noise and illumination from night lighting would significantly detract from the experience of solitude at the Bisti WSA (a 3-mile distance) and De-na-zin WSA (a six-mile distance) and is so reported in the DEIS and in the Recreation and Wilderness TRs. These impacts would have cumulative effects when combined with those resulting from mining activities in close proximity to the WSAs.

Recreation and Wilderness Resources

Comment. While Navajo Lake and Bluewater Lake State Parks receive extended use at the present time, Angel Peak does not. The idea

of a coordinated plan of operation through the New Mexico Natural Resources Planning Department is not feasible or practical. In the past, New Mexico has not been able to initiate an action plan for joint use. (1.)

Response. Pages 3-5 and 4-9 of the Recreation Resources TR point out the close proximity of Angel Peak to the primary community of residence for the workforce. The report identifies problems associated with managing the limited campsites and picnic facilities (total 16) with increases in use. The mitigation recommendation cited above does not mention involvement of the State Natural Resources Planning Department, but suggests that the applicant monitor the effects of New Mexico Generating Station on individual visit use on picnic areas and campsites closest to Farmington. The "coordination" is in reference to PNM. Assuming responsibility for encouraging employees to use the range of available resources and not concentrate in one area, was referred to on p. 1-30 of the DEIS (Applicant-Committed Practices) under a discussion of an employee information program.

Comment. Page 7-1 of the Recreation Resources TR states recreation use is predicted to subside after 1996. Most statistics collected on recreation use may show a decline for a year or two. After a new recreation area is added to some population base, there is a gradual increase in use in all areas. (498.)

Response. The statement in the TR is specifically in reference to impacts associated with the workforce and their use of recreation resources in the study region. As the workforce and associated population increase subsides, so would the demand for, and use of, recreation resources. Continued use of the resource base is expected after 1996; however, it is no longer expected to place unusual demand on available resources and thus is not considered significant after the peak workforce period.

Comment. Major transmission line corridors bordering the park, fully visible from Pueblo Alto, Pueblo Pintado, Kinya'a, and Kin Bineola (merely examples) are regarded as major impediments to the NPS's ability to interpret and manage resources under its jurisdiction unimpaired. As may be appreciated, it is difficult to help visitors recreate the isolation and mystery of the Chaco culture when the signs of this civilization (in the form of coal trucks, shift-workers traffic, and major transmission lines) are so close by and intrusive. The NPS reiterates that the T-2 corridor presents major problems to CCNHP, and we recommend that it not be selected as one of the routes. Every visitor to CCNHP would cross under the line on entering and leaving the park, and every view point to the north would be obscured by the towers, regardless of mitigating paint or placement. The only satisfactory mitigation would be to select another transmission line corridor.

Comparatively scanty analysis of effects on visitors when contrasted with the treatment given to wilderness study areas are all examples of the "undervaluing." (498.)

Response. The TR identified impacts to the recreation experience from transmission lines (photography, sightseeing, hiking, climbing, and visiting historical sites) for visitors to CCNHP, as well as the wilderness study areas (Cabezon, Ojito). The report states: "The transmission lines would cut across the natural landscape in an unnatural way, affecting the quality of view from sites used for recreational purposes" (p. 4-5). Impacts of the T-2 transmission line would be of some magnitude because, although the proposed line is not inside the park boundary, approximately two-thirds of the park's visitors enter and leave the park from the northern entrance, and would thus cross beneath the line. Moreover, the NPS maintains an interpretive exhibit at Pueblo Alto which directs visitor attention to the north towards features associated with the Chacoan civilization such as Huerfano Peak, the Chuska-Lukachukai range, the Great North Road, and outliers to the north. The cumulative impacts to the visitor experience from the combination of the transmission line with rail and coal development are considered significant and are reported as such in the Draft Cummulative Overview.

Comment. Discussions regarding recreation on pp. 2-22, 2-24, 3-58, II-3, II-4, III-4 and CI-7 do not consider consumptive (hunting and fishing) and nonconsumptive (observation and photography) fish and wildlife values.

One area of particular concern, for example, is the San Juan River high quality fishing water (pp. 3-15 and CI-7). This reach of the river is presently experiencing overuse. The NMGS, possible New Town and other energy related developments are expected to increase recreational use in the San Juan Basin by up to 18 percent (Draft San Juan Basin Cumulative Overview, p. 3-22). Chapter 3 should include discussions of fish- and wildlife-related recreation and suggested mitigative measures to meet increased recreational demand. (433.)

Response. Reference is made to the San Juan River as a primary recreation resource (p. 2-22) in the DEIS; the TR (pp. 3-30, 4-7) identifies the first 8 miles below the Navajo Dam as the best trout fishing area in New Mexico and goes on to estimate the number of fishing days for the two-county region increasing by 7183 with the increase in population from the proposed project. The report states that the increase could add a significant demand to resources which are already experiencing rapid increases in participation rates. Both the per-person catch and the quality of the fishing experience would be affected by increases in fishing days. See changes to DEIS p. 3-15 in response to mitigation comment.

Comment. The influx of construction and operation personnel and related cumulative population increases for mining and related activities of up to 10 percent per year, and the predicted levels of increase in recreation user days in San Juan and McKinley counties, is of concern to "carrying capacities" of existing regional park and recreation resources. The nearby Navajo Lake State Park and Bluewater Lake State Park may be expected to be heavily impacted, as these parks are the only two regional water-based recreation areas and are presently overloaded on typical summer holiday weekends. It is doubtful that the state could fund and construct additional resources required to meet the forecasted demand within the time frame of expected impacts. (478.)

Response. Existing and projected visitor-use (i.e., recreation user-days) for Navajo Lake and Bluewater Lake state parks was discussed in both the TR (pp. 4-7 and 4-8) and in the DEIS (p. 3-23 and CI-7). "Total participation days for water-based recreation activities in the two-county area would increase by 4176 during the peak employment period (1992) for NMGS" (p. 4-8). The DEIS points out that state parks could experience an increase in use well beyond their capacity to provide adequate maintenance and supervision of facilities. Suggested mitigation (p. 3-58 of the DEIS) included "supplemental funding from PNM . . . in the form of a lump sum donation" to public agencies facing park supervision and maintenance cost increases as a result of NMGS-related population influx to the region.

Comment. In the area of impacts to social and economic conditions, concern was expressed about the pressure that the increased population would place on the local recreational resources, particularly those on Jicarilla Reservation. Concern was expressed that the new population would damage Jicarilla lands and resources through such activities as unauthorized wood gathering, off-road vehicle use, poaching, disturbance of archeological sites, and livestock theft. The Tribe currently lacks the financial and law enforcement resources to adequately protect lands from such depredations. To handle these additional problems may require building a permanent police station in the southern portion of the Jicarilla Reservation and to increase law enforcement staff by 25 percent or more. Even then, Jicarilla lands and property may not be adequately protected because of jurisdictional questions relating to non-Indians on Indian lands. (269.)

Response. Recreation resources on the Jicarilla Apache Reservation are identified and described according to types of facilities and recreational activities on pp. 3-13 and 3-18 of the TR. Impacts related to increases in recreation resource users were identified in the DEIS (pp. 3-22 through 3-23) and mitigation recommendations were outlined on p. 3-58 of the DEIS. Affirmation of visitor use problems should be initiated through a monitoring program by the Tribal recreation planner, and coordinated with the PNM personnel director for supplemental funding to increase supervision.

Comment. The Recreation TR states that the general study area is not a high recreation use area. The population of the San

Juan, McKinley, Sandoval, and Rio Arriba Counties is about 198,400. The visitation to the recreation areas listed in the report with an update on Southwest Region National Park Service areas amounted to about 5,946,500; and no statistics were listed for Fish and Game areas, so we consider recreation a pretty high use. The above recreation use did not include proposed recreation areas. (498.)

Response. Planned and proposed recreation resources in the study region were included as a part of the assessment and are reported on p. 3-25 of the Recreation TR. Added picnic and campsites at Navajo State Park; the proposed Animas-La Plata water storage project and planned recreation facilities (to provide 307,500 recreation days); the development at Ridges Basin Reservoir (210,000 recreation days); and planned recreation development on the Southern Ute Reservoir (97,500 annual recreation days) are also identified in the TR. With the exception of the Navajo Reservoir and San Juan River, general use of resources within the study area for purposes of recreation are limited to specific areas with high visitor attraction such as CCNHP, and WSAs (Bisti, De-na-zin). Reasons for the low visitation in the rest of the area are identified in the TR (p. 3-14) and include: poor roads; lack of water; prohibitive land ownership patterns affecting access; and lack of tourist services (gas stations, eating facilities, etc.).

Transporation

Comment. The very substantial increase in traffic and number of vehicles would severely impact the Navajo Nation lives and livestock. The present project plans do not require any compensation for these losses to the Navajo people.

Costs of maintenance and improvement of the highways and off-highway roads would substantially increase.

Noise, Blasting Damages and Transportation Problems - The study, which is not complete and adequate, reveals that there would be some impacts on the people, livestock and wildlife, but the impact is not quantified. Blasting vibration may also cause damage to the archaeological, fossil and other fragile resources. Significant overloading of NM 371 between Farmington and the NMGS site is anticipated. Mitigative measures are not discussed, or are inadequate and unclear and no lease stipulations have been developed to eliminate or minimize these problems. (9, 444.)

Response. Transportation impacts along New Mexico 371 are addressed in both the DEIS and Transportation TR as well as in the Cumulative Overview Report. Mitigation recommendations for segments 20 and 21 of New Mexico 371 include regular maintenance (blading, repair of culverts and drainage) by the applicant (PNM) during the construction phase of the project when commuter traffic volume is estimated to reach 650 vehicles per day. The New Mexico State Highway Department (correspondence dated 4-8-83) states that New Mexico 371 is designed to carry 800 heavy commercial vehicles per day, and legal loads at less than this rate would allow a 20-year design life for the road. (Page 1-13 of the Project Description TR shows 300 round trips per haul day on New Mexico 371 as the worst-case scenario.) The reasonableness of the mitigation recommendation made in the Cumulative Overview report for widening New Mexico 371 to 4 lanes was challenged by stating that "the cost of building such a road is likely to be disproportionate to the degree of safety that would be realized. Constructing the additional 2 lanes would cost approximately $850,000 per mile in 1983 dollars."

Further, applicant-committed practices outlined on p. 1-30 of the DEIS state that PNM could actively encourage ridesharing (carpools and van pools or private commute buses) for employees to reduce commute vehicles along access roads to the plant site.

Specific reference to coal transport and blasting effects are addressed in the SJRRCL DEIS.

See changes on FEIS, p. 3-26 to discuss potential traffic-related impacts to domestic livestock.

Comment. A number of commenters provided information to update the location and service of railroads as reported in the DEIS for the study region. (16, 457, 496, 514.)

Response. See changes on FEIS p. 2-25 and Map 2-5 in response to this comment. In addition the Star Lake-Bisti railroad was assumed to be operational in 1985. Since it is impossible to know what the outcome of litigation would be, no change in the date is made.

Comment. Also inadequately addressed were the impacts associated with traffic generated on New Mexico 44 and other roads across Jicarilla lands as the increased population generated by the proposed developments travels from the Farmington area to Albuquerque and to such recreation sites as Heron and El Vado lakes. The draft documents and accompanying TRs discussed traffic generation along Highway 44 from Nageezi northward and from Cuba southward, but did not cover the intervening stretch. That portion of the road crosses Tribal land and would also have to handle an increased traffic flow as people and goods move between Albuquerque and the Four Corners area. Highway 64 across the Reservation would also be faced with an additional traffic burden as it is the most direct route from Farmington to such recreation areas as Chama and Heron Lake. This is of particular concern, as that road passes through Dulce and is not in the best condition. (269.)

Response. Because of NMGS's proposed location 35 miles to the South of Farmington, NMGS-related travel (both commute travel and recreational travel) would be concentrated in the greater Farmington area, impacting the northern portions of New Mexico 44 from Huerfano to Bloomfield and would not significantly affect the segment of roadway crossing the Jicarilla Reservation. (Refer to the Transportation and Recreation TRs for detailed discussions of impacts.)

Comment. The final item deals with the mitigating measures mentioned on DEIS p. 3-59. The New Mexico State Highway Department would place conditions on road usage only if loads exceed legal maximum limits. If this situation arises, the conditions and terms would be handled on a case by case basis. (44.)

Response. Mitigation suggestions regarding road surface maintenance would be specified and enforced as a part of permitting for Conditional Use of New Mexico State Highways. Recommendations cited in the DEIS were offered by the Environmental Division of New Mexico State Highway (phone conversation 10/06/81) and should be considered as general guidance when a detailed study of weight limits and frequency of use is made at the time of permit application.

Comment. The Bloomfield Highway extension, referenced on page 2-27, is in the Department's Five-Year Plan. (44.)

Response. See changes on FEIS p. 2-28 in response to this information.

Comment. NM 371 begins at a junction with NM 57, northeast of Crownpoint, and travels north to Farmington. NM 57 travels through Thoreau north to a junction with NM 371, then east and north through Chaco Canyon National Monument to a junction with NM 44 at the Blanco Trading Post. References to these routes on page 2-26 should be changed to accurately reflect the true beginning and ending points. All remaining dirt or gravel portions of NM 371 have been programmed for construction. The final stages of construction on NM 371 should be completed in 1984. (44.)

Response. Specific reference to the origin and termination points of NM 57 and NM 371 are acknowledged. See changes on FEIS p. 2-27 in response to this comment.

Social and Economic Conditions

Comment. BLM should require Navajo hiring preference; otherwise jobs would go to non-Indians. The EIS should address Navajo hiring and skill training issues, and describe potential employment benefits. Would use of union labor reduce Navajo hire potential? (49, 79, 95, 109, 118, 128, 396, 431, 444, 449, 451, 496, 509.)

Response. Labor unions are forbidden by law to discriminate against potential members on the basis of race, religion, or sex. Any person meeting entry requirements is eligible for membership. Moreover, AFL/CIO craft unions and the Navajo Tribe have labor preference agreements stipulating that qualified Navajos would be preferentially

hired up to a certain percentage in San Juan and McKinley counties (Adcock, 1983). While Navajos are not discriminated against by unions, experience indicates that Navajos do have more difficulty meeting entrance requirements, or completing apprenticeships.

Skilled Navajos who are not union members would probably have difficulty gaining employment on the NMGS project, depending upon specific union hiring agreement stipulations. Many unskilled or semi-skilled positions are often not subject to union membership constraints.

Comment. How many NMGS jobs would go to Navajos? What about quotas, or hiring preference, and training programs to increase the potential for Navajo employment? It seems that few Navajos would gain jobs from this project. Estimates of the number of potential Navajo employees should be included in the impact assessment. (9, 49, 79, 95, 109, 128, 333, 160, 167, 187, 396, 431, 444, 449, 450, 451, 496, 509.)

Response. Appendix D of the Social and Economic Conditions TR contains information on Navajo employment, unemployment, and labor force characteristics (see pp. D-34 through D-53). Navajo employment patterns at the five major power plants that have been operating on or near the Navajo Reservation since the early 1960s are examined. The two facilities with the largest number and highest proportion of Navajos compared to total work force are the two plants located on the Reservation. These two facilities have Navajo preferential hiring clauses as part of their lease agreements. In 1980-81, approximately 40 and 60 percent of their respective operation work forces were Navajo, compared with 10 percent or less at off-reservation power plants. Similarly, Navajo participation in power plant construction was higher for the on-reservation plants than for the off-reservation plants.

While the presence or absence of preferential hiring agreements played an important role in determining Navajo employment levels at the five power plants examined, it is also recognized that the potential magnitude of Navajo employment on similar projects is largely a function of the availability of qualified Navajo workers. Regardless of employment policies, if the demand for a particular skill and experience could not be met by qualified Navajos, then non-Navajos would be hired. According to the Coordinator for Apprenticeship Programs of the Plumbers and Pipefitters Union, a Navajo labor preference agreement has been in effect for a significant length of time (Thomas 1983). This agreement is between the Navajo Tribe and the National Building Trades Union branch of the AFL-CIO, and protects Navajo job opportunities as apprentices and journeymen on projects constructed on the Reservation. Another part of the agreement is that the Navajo Nation would provide appropriate job training to ensure that qualified Navajos would be available to fill available positions. The job skill center at Crownpoint is working to provide needed training (Adcock and Associates 1983).

The following excerpt from the Social and Economic Conditions TR (pp. D-52-53) addresses the availability of relevant Navajo training opportunities:

> Historically, building and trades unions, tribal officials, and utility companies operating power plants have recognized the desirability and need for upgrading the skills of the Navajo labor force while trying to increase participation in the construction and operation of generating stations both on and near the Reservation. In 1975, the Navajo Construction Industry Manpower Program established a joint tribal/union training facility on the Reservation. Preapprenticeship training was provided in 24 crafts (many of which included skills that could be utilized in power plant construction and operation). In 1979, the Navajo Skills Center (funded by the Navajo Division of Labor with CETA Title 3 monies) was opened in Crownpoint. (The Navajo Construction Industry Manpower Program was incorporated into the Navajo Skills Center [Martin 1982]). The purpose of the center was to address the high unemployment rate within the Navajo Nation through the provision of vocational and technical

training programs related to Navajo labor market needs. (The center is currently reestablishing its program and seeking new funding sources [following cuts in federal funds] in order to maintain the center's viability [Morgan 1982].) Included among the training programs were preapprenticeship classes for plasterers, iron-workers, pipefitters, heavy equipment operators, and electricians. In addition, training in construction skills were also available through 3- to 4-year union-sponsored apprenticeship programs located on-site during place construction. Persons enrolled in the programs received both on-the-job and classroom training plus an hourly wage (Martin 1982; Morgan 1982).

Operation phase jobs provide better long-term employment opportunities for Navajo workers than construction jobs. However, the only significant training/apprenticeship programs for operation jobs are provided on-site by utility companies operating the generating stations. The programs for each utility (PNM, APS, and SRP) differ in terms of their type, number, size, and length as well as qualification criteria. Nonetheless, they represent an important mechaism in the local area for maintaining and increasing the number of Navajo operation workers and for enhancing their skill levels (Kindred 1982; Anderson 1982; Hartsig 1982).

In summary, the construction and operation of NMGS would represent additional (rather than new) employment opportunities for Navajo workers since large-scale power plants have been constructed on or near the Reservation beginning in the early 1960s. In addition, the number of Navajos employed in power plant construction and facilities and additional units have been built and as Navajos have gained relevant work experience. Because NMGS is proposed to be off-Reservation, the availability of qualified Navajo workers would be a critical factor in determining how many work there. The demand for qualified local power plant workers (which has exceeded supply historically as well as currently) would be increased significantly with NMGS. Thus, the number of Navajos employed at NMGS would depend principally on the opportunities for Navajos to receive training in power plant construction and operation-related skills.

It should be noted that as part of Applicant Committed Practices PNM has committed to "undertake recruitment and training programs to ensure that Native Americans have an opportunity to gain from potential employment benefits of the project."

These impacts refer to the potential cumulative effects of accelerated energy resource development activity in areas occupied by traditional Navajos. For further discussion of the combined effects of SJBAP projects on Navajos, refer to the Cumulative Overview and the SJRRCL DEIS.

Since it is so difficult to quantify the NMGS-related costs and benefits to Navajos as a group, it is almost impossible to conclude whether benefits would outweigh costs or not. The likelihood is that some individuals would benefit from the project (primarily through employment opportunities) while other individuals would be adversely affected (primarily through indirect impacts associated with an influx of non-Navajos to the area, as well as a reduction in opportunities to pursue traditional lifestyles -- see Appendix D of the Social and Economic Technical Report).

Comment. Disruption of the Navajo relationship to their land and ethnic clashes caused by the influx of newcomers could result in deterioration of physical and mental health. The DEIS does not adequately address the need for health care in Crownpoint and other Native American communities, nor does it estimate costs to state and federal agencies responsible for Native American welfare and services such as roads, police,

public assistance, and schools. (100, 106, 160, 164, 165, 333, 428, 484.)

Response. Because the direct impacts associated with immigrating NMGS workers would occur in communities in the greater Farmington area, population impacts and associated service needs including health care would be negligible in communities like Crownpoint. Native Americans who would benefit from NMGS employment are already residents of communities such as Shiprock, Crownpoint, Farmington, or reside in rural areas throughout the Reservation and "checkerboard area." As such, these individuals are already consumers of public services, and their demand for services is not expected to increase as a result of the NMGS project.

Refer to the SJRRCL EIS and the Cumulative Overview for discussions of the cumulative direct and indirect impacts of the proposed San Juan Basin developments.

Comment. The EIS should include information about what has happened in other regions affected by large-scale energy development, where the "boomtown syndrome" has resulted in adverse impacts to community infrastructure and services, as well as increases in problems such as mental illness, child neglect, spouse abuse, alcoholism and drug use. The boomtown issues are not adequately addressed. (109, 165, 166, 323, 428, 444, 484.)

Response. BLM's analysis of potential social and economic impacts indicates that NMGS would accelerate growth of population and the regional economy in northwestern New Mexico, but that few social and economic impacts would be of such magnitude, intensity, or duration that they could justifiably be considered "significant." For the most part, impacts from the proposed action would follow patterns that have become established in the Farmington area as a result of previous large-scale energy resource development activities, involving some adverse impacts (such as possible local inflation and competition for labor) and beneficial impacts (such as job opportunities, increases in personal income and tax receipts). In no affected community would the annual rate of population growth either with or without NMGS reach 10 percent.

Project-related demand for community infrastructure and services (housing, municipal services, education, health services, human services, law enforcement, fire protection, transportation, and community recreation) are assessed in the Social and Economic TR. Impacts identified cannot be considered on the same scale as the "boomtown syndrome" described for rapid development of resource towns in Wyoming and Colorado. The two areas where potential impacts were found to be too uncertain to label either significant or not significant (housing and human services) would be assessed again at the applicant's expense 12 months prior to construction.

The "boomtown" literature referred to adverse social impacts resulting fom the rapid development of resource towns throughout the Rocky Mountain states in the 1970s. The literature reports that increases in stress-related social and psychological problems occurred in conjunction with "boomtown" levels of growth, ranging from in excess of 10 percent (and sometimes more than 100 percent) growth per year in communities with neither experience at accommodating growth spurts nor excess (or easily expanded) infrastructural capacity.

Comment. Who would pay for the increased services needed? (109, 166.)

Response. Impacts of NMGS on public finances are assessed in the Social and Economic Conditions TR (pp. 4-11 through 4-24 and summarized in the DEIS p. 3-26). Few significant impacts on capital spending are expected to result from NMGS-related population increases, and in some communities and school districts the project would have a positive effect on operating funds. Overall, NMGS would have a positive impact on public finances in the greater Farmington area, although projected expenditures would exceed anticipated revenues in some years. NMGS would increase the assessed valuation of affected taxing jurisdictions, thereby generating either increased property tax revenues or lower tax rates. (As the assessed

valuation or tax base of an area increases, a lower mill levy is needed in order to produce constant revenues. If the need for revenues is increasing at a lower rate than the tax base then, in general, property taxes paid by individuals decrease rather than increase. However, if communities perceive a need for additional services and expend funds at a faster rate than the tax base for assessed valuation is increasing, then the mill levy will increase and the burden on taxpayers is greater.) For the most part, project-related direct and indirect tax revenues would cover the costs of needed expansions in community facilities.

Comment. How many NMGS jobs would go to local workers? What types of skills would be required? Address the need for local training programs. (109, 166, 167, 458, 532, 534.)

Response. PNM estimates that 40 to 80 percent of the total NMGS construction and operation labor requirements would be held by local workers depending on the availability of local qualified craftsmen as was stated on DEIS p. 1-20. For purposes of the social and economic impact assessment, levels of annual local hiring for construction were assumed to be 46 percent, 65 percent, or 80 percent depending upon projected local labor availability in any given year. For operation employment, we assumed 50 percent local hiring. (For a description of methods used to project local labor force availability, see Appendix A of the Social and Economic Conditions TR.) Navajo employment and training issues are addressed in Appendix D of the Social and Economic Conditions TR (pp. D-34 through D-53) and are also discussed in a previous response in this section.

A peak workforce of approximately 950 construction workers would be required to build one 500 MW unit of NMGS. A table on p. 1-11 of the Social and Economic Conditions TR shows an estimated breakdown of employment skill requirements for NMGS construction, averaged for the construction of all 4 units.

Comment. The social and economic mitigation measures recommended are too vague. Detailed mitigation and monitoring should be included in the EIS, with clear identification of responsibilities for funding and implementation. (109, 166, 490, 532.)

Response. Few potential social and economic impacts that could be considered significant were identified in the DEIS. The areas in which potential NMGS-related impacts could be significant are housing and social services. Mitigation recommendations for social and economic impacts are discussed in Section 5.0 of the Social and Economic TR. Because of the uncertainties involved in predicting the availability of housing and social services at the time of project start-up, the applicant has committed to reassessing these social and economic issues one year prior to project start-up as stated on DEIS p. 1-30. Specific mitigation measures would be determined at that time.

Comment. The Farmington area cannot adequately absorb the NMGS work force. Housing, public facilities and services would be overtaxed severely. PNM should be made to provide worker housing. (118, 395.)

Response. BLM's analysis indicates that NMGS would result in a consistently higher annual housing demand in the study area during the project's life. For the most part, however, communities in the greater Farmington area would be able to accommodate worker housing needs, although a shortage of conventional single-family and multi-family units is expected to exist in the area beginning in the mid-1980s. Given the difficulty in precisely predicting housing availability in any given year, PNM has committed to reassessing housing availability 12 months prior to project start-up (see Applicant-Committed Practices p. 1-30). If it were demonstrated that the Farmington area could not accommodate NMGS workers at that time, PNM would consider mitigation measures, including provision of a construction worker camp, mortgage interest rate subsidies for NMGS employees, or company-sponsored development of new mobile home park space.

Comment. Data on Thoreau, Crownpoint, and Shiprock should be included. These communities might be more affected than Aztec and Bloomfield. The discussion of impacts on Crownpoint is very brief and should be expanded to discuss every issue raised in the

resolutions of checkerboard chapters and the Chaco Lejin Energy Impacts Committee. (118, 431, 484, 532.)

Response. The socioeconomic impact assessment focuses on the area within which major socioeconomic impacts from NMGS would be likely to occur. For the purposes of identifying the communities that would be most affected by the proposed action, the analysis concentrates on those areas where in-migrating workers would most likely choose to reside, since in-migrating workers and their families represent the greatest impacting agent at the community level. Communities on Indian Trust lands, such as Crownpoint and Shiprock, result from lands which have been administratively set aside for the use of the federal government (BIA) to establish and maintain offices and residences and such support systems necessary to fulfill its mandated trust responsibility to the Navajo Tribe. Inhabitants of these communities, who are not native to the area, are primarily employed by the federal government, Navajo Tribe or operations supportive of these functions. Residential facilities for those not affiliated with the above services are not legally or, in general, practically available to transients or migratory workers. The main factors considered in analyzing residential preference include commuting time and distance, availability and cost of housing, community amenities, anticipated length of employment, needs of accompanying family members, and jurisdictional constraints (such as those placed on non-Navajos residing on Navajo lands). Although current residents of Thoreau, Crownpoint, and Shiprock could obtain NMGS project-related employment, our analysis did not provide support for assuming that in-migrating workers would choose to move to those communities.

Comment. The EIS assumes workers would live in the greater Farmington area, but past experience has shown that when major projects are developed, workers set up temporary housing near the work site. (118, 451.)

Response. Given the proximity of the communities in the greater Farmington area to the proposed plant site, and the complete lack of facilities at the site, it is not likely that workers would set up temporary housing. BLM's analysis indicates that the Farmington area should be able to accommodate NMGS-related in-migrating workers and provide them with housing and services they would seek. Furthermore, the applicant is committed to reassessing project-related housing needs 12 months prior to construction, and to considering mitigation options should housing supply in the Farmington area appear to be strained at that time. More specific requirements for timely mitigation have been suggested in the mitigation measures section as being needed.

Comment. The economic benefits of the project are not adequately addressed. Information on state and local unemployment rates, project-related jobs, payroll, and tax revenues is poor. An economist should have been contracted to address these economic issues. (124, 332, 438, 534.)

Response. The firm of Adcock and Associates, Inc., an economic analysis firm based in Albuquerque, New Mexico that has years of experience working in northwestern New Mexico, was hired on contract to assess project-related impacts to the regional economy, employment, personal income, and public finances, as well as community facilities. The results of their work are presented in Chapters 3.0 and 4.0 of the Social and Economic Conditions TR, and was briefly summarized in the DEIS (pp. 5-10, 3-26, 3-27).

Comment. Revise the social and economic assessment to reflect PNM's delay of action and incorporate more recent data on regional social and economic conditions. Would delay of construction of the units worsen boom/bust impacts? (89, 151, 431, 457, 484.)

Response. Changes are provided on FEIS pp. 3-61 thru 3-63 in response to this comment.

Comment. The DEIS does not contain adequate discussion of Native American concerns and project impacts on the Navajo culture. Analysis should be more thorough, and based on literature, interviews, and public hearings held at the Chapter level. Impacts on sacred sites and traditional values should be assessed. (9, 152, 160, 310, 355, 389, 431, 444, 449, 451, 484, 496, 534.)

Response. Appendix D of the Social and Economic Conditions TR specifically addresses Native American concerns and potential project impacts on traditional Navajo lifestyles and values. This analysis is based on an extensive survey of relevant secondary sources (including ethnographics, surveys, agency reports, recent research and impact studies, field interview notes, and reports and transcripts from public meetings on energy development, including those held at the Chapter level). In addition, some original interviewing and field work was conducted by Quivira Research Center of Albuquerque, New Mexico, to document the location of sacred sites and other resources important to the Native Americans potentially affected by the project. Their findings are presented in the Cultural Resources TR. In addition, because Native Americans in the study region are workers, consumers of goods and services, and users of community facilities and services, they represent a substantial part of the larger community for which impacts are assessed in the main body of the Social and Economic Conditions TR.

Comment. Has the involvement of the Navajo Nation in the final decision making process been explicitly defined?

The Navajo Tribe should be given the opportunity to participate in the decision-making process to facilitate relocation, develop mitigation measures, etc.

Local Navajo communities should have a strong voice in decisions regarding the destruction or preservation of features of significance to Navajo culture and in the kinds of measures that might be taken to mitigate impacts on such features. Graves especially are likely to be much more common than the data presently available indicates. Lack of Navajo participation in such decisions is almost certain to lead to conflicts, no matter how sympathetic might be the non-Navajos involved, for very complex issues in dynamic and changing cultural traditions are involved. (49, 152, 160, 396, 444, 532.)

Response. The involvement of the Navajo Tribe to date is documented in Chapter 4 of this EIS. The involvement of the Navajos throughout the environmental analysis and decision-making process is clearly delineated in the formal cooperative agreements between BLM, the Navajo Tribe and the BIA, which are part of the official casefile for this project (NM 30840) available for public review and inspection in the BLM NMSO, Santa Fe.

For example, in the MOU between BLM and the Navajo Nation, the following goals were identified:

- Assigning a single focal point within BLM and the Navajo Nation for each proposal in order to convey and receive all pertinent information concerning the proposals.

- Ensuring that tribal issues and concerns are adequately addressed in each EIS.

- Providing input during the environmental process. Specifically, this may involve the review of TR dealing with issues that the Tribe has concerns about, review of the PDEIS, DEIS, and EIS.

- Providing input during the environmental process in the development of mitigating measures and special stipulations, which will be used to lessen environmental impacts on Tribal Lands.

- Providing an opportunity for tribal review of related documents that the Tribe has jurisdictional or particular interest in. (Memorandum of Understanding 162, December 30, 1982).

Comment. Social and economic impacts on land users in transmission and pipeline ROWs should be addressed. What would happen if a lease or grazing area is within a transmission line ROW? (152, 194, 431.)

Response. No significant social or economic impacts on land uses are expected from transmission or pipeline ROWs. ROW grants across BLM and trust lands would be non-exclusive use permits. Any authorized user, such as a grazing leasee would be able to continue present uses.

Economic impacts on land users because of short-term or long-term forage loss are described in the Vegetation TR. Forage losses associated with the water supply system are given in AUMs and dollars lost on pp. 4-23 and 4-24. Forage losses associated with transmission system are given on pp. 4-51 through 4-53.

Comment. As a result of the intrusion of non-Indians onto Jicarilla Apache lands, the Jicarilla Apaches may need to expand police facilities and services to help prevent poaching, vandalism, livestock theft, disturbance of archeological sites, and damage to gas well equipment or oil storage tanks. Jicarilla Apaches who rely on Farmington for goods and services would be affected by local inflation, the strain on social services, and more traffic on the roads. Impacts on the Jicarilla Apaches are not adequately addressed. (153, 161, 269.)

Response. BLM's analysis of local labor force availability and residential preference of in-migrating workers indicated that most NMGS-related in-migrating workers would reside in the greater Farmington area. Direct NMGS-related population effects on the Jicarilla Apache reservation would not occur. While one of the proposed alternative transmission lines would pass within 20 miles of the Jicarilla Apache reservation, construction of such a line would involve a relatively small work force (about 100 workers) who would be in the area for only a short period of time. Early interviews and correspondence with the Jicarilla Apaches indicated that indirect impacts of the NMGS project on their reservation would not be significant. It is true, however, that Jicarilla Apaches and other New Mexico residents who use Farmington as a major source of supplies and services would be affected if the quality, cost, or accessibility of those supplies and services were to be indirectly affected by NMGS and other projects in the area.

Impacts of NMGS on Navajo residents of the checkerboard area are assessed in the Social and Economic Conditions TR prepared for the NMGS EIS (see especially Appendix D). Refer to the SJRRCL DEIS and the Cumulative Overview for discussion of the direct and indirect effects of other projects on the Jicarilla Apaches and Puebloan groups.

Comment. The assessment of population growth should include an examination of potential changes in racial/ethnic structure and shifts in political power, as well as an assessment of the impacts of population influx on law enforcement, medical and education facilities, and employment. (160.)

Response. As indicated in the Social and Economic Conditions TR, the population of northwestern New Mexico increased substantially between 1970 and 1980. The proportions of Native Americans and other racial groups remained roughly the same throughout this period, because the in-migration of Anglos and Hispanics seeking energy-related jobs was balanced by the high rate of natural increase among Native Americans. As energy development continues in the San Juan Basin, it is likely that workers (primarily Anglos and Hispanics) would continue to in-migrate to the area. This could result in a shift in the proportion of Anglos to Native Americans, and a concomitant shift in some political power from long term residents of the area to relative newcomers, particularly in off-reservation communities. These issues are further discussed in Chapter 6.0 of the Social and Economic Conditions TR.

Impacts of NMGS-related in-migrating population on law enforcement, medical and education facilities, and employment are assessed in Chapter 4.0 of the Social and Economic Conditions TR. While the analysis indicated a substantial potential employment and income benefit in the greater Farmington area, impacts to law enforcement, medical and education facilities were found to be not significant because of projected facility surpluses in the area, as well as anticipated NMGS-related tax revenues to cover the cost of needed expansions. (Adverse impacts to housing and social services, however, were assessed to be potentially significant.)

Comment. The terms "lifestyles" and "values" are not defined. Do these include the short life expectancy, high infant death rate, high alcoholism rate, high unemployment among Navajos, or are the authors of

the documents using the terms only in a positive context? Because terms are not defined, they are not adequately dealt with. (160, 438.)

Response. "Values" refers to the culturally conditioned beliefs and attitudes that modify the perceptions or worldview of members of a culture group. "Lifestyles" refers to the behavioral patterns shared by members of a culture group and manifested in religious, social, economic, and political organization and activities. Traditional Navajo values and lifestyles are examined in both the historical and current contexts in Appendix D of the Social and Economic Conditions TR.

Comment. The documents do not address impacts on Native American mental health, crime, and alcoholism rates, and the costs of increased burdens on the infrastructure and services in Native American communities. (49, 162, 165, 310, 375, 431, 469, 484, 496.)

Response. Native Americans represent approximately one half of the population of San Juan and McKinley counties. As workers, consumers of goods and services, and users of community facilities and services, they represent a substantial portion of population of the study region for which social and economic impacts were assessed. Based on an analysis of labor availability and residential preferences of in-migrating workers, it was determined early in the study process that most in-migrating workers would choose to settle in the greater Farmington area. BLM's analysis of NMGS-related impacts to community infrastructure and services, therefore, focuses on the communities in the greater Farmington area. It is anticipated that Native Americans who currently reside in communities such as Crownpoint and Shiprock would gain employment as a result of NMGS; however, no substantial new population is expected to be attracted to those communities because of the project.

While no direct impact on facilities and services in Native American communities is expected to result from NMGS, some indirect impacts could occur as a result of the acceleration of resource development in the area. Unavoidable Adverse Impacts described in the Social and Economic Conditions TR include:

> ...acceleration of the rate of culture and increased incidence of value conflicts. New stresses could manifest as increased alcoholism, drug abuse, or other social problems (p. D-67).

Refer to the SJRRCL EIS and the Cumulative Overview for discussions of the direct and indirect impacts of coal and other projects on Native American communities.

Comment. Energy development brings major economic forces from outside the community, such as energy companies and chain stores. When the resources are gone, they would lose interest and leave. (166.)

Response. The Social and Economic Conditions TR assesses both the positive and negative impacts associated with the proposed action. The NMGS project would contribute to many trends already evident in the study region, including the attraction of outside economic interests, which often accompanies population growth. Some residents who gain access to more or better jobs with new businesses or a wider selection of lower cost goods in new chain stores and shopping malls would perceive this change as beneficial. Others who must compete with industry wages to keep employees or who are driven out of business by new competition would perceive this change as adverse.

It is true that outside interests may leave when the resources that attracted them are gone. NMGS, however, would have an estimated 40-year project life, long enough to employ some individuals for almost all of their working lives. Relatively long-term projects like NMGS can help stabilize local economies and stimulate trade and service sector growth, so that by the time the NMGS project would be complete, industry originally stimulated or attracted because of it may be able to sustain the employment levels and general regional economy.

Comment. The EIS should assess employment impacts in the national context. Each new power plant results in an ultimate loss of 4000 jobs in labor-intensive energy efficiency upgrading. (229, 346.)

Response. From the local perspective, the addition of a great number of new jobs from

NMGS is a significant potential benefit. Assessing the impacts of capital-intensive vs. labor-intensive industrial projects on the national economy is beyond the scope of this EIS.

Comment. All transmission lines that are shown on the maps and proposed for this project cross Navajo land, yet no mention is made of whether the owners of these lands have been consulted on their willingness to allow such projects. (310, 375, 484.)

Response. Owners of these lands have not yet been directly contacted by the applicant. Efforts have been made by BLM to inform persons whose lands may be affected of opportunities for information exchange and issue identification. Consent by land owners would be required before the transmission lines could be built.

Comment. Since graves and sacred sites are part of Navajo tradition, they should be discussed under Traditional Values and Lifestyles, as well as under Cultural Resources. (9, 431.)

Response. Appendix D of the Social and Economic Conditions TR addresses Native American concerns and potential impacts to traditional Navajo values and lifestyles related to the NMGS proposal. This appendix incorporates the Cultural Resources TR by reference (pp. D-9 and D-56) and further discusses cultural resource values from a traditional Navajo perspective (pp. D-62, 63).

Comment. Determination of the proper level of decision-making in each kind of action within Navajo society is very important. Many or most of the issues raised above should properly be handled by the individual or family concerned, some by the local community and a few by the tribe as a whole. In many cases the tribe or the Bureau of Indian Affairs, or both, have responsibility for protection of the interests of individuals or communities in their dealings outside the tribe, but this does not mean that these bodies have the power to override the rights of individual Navajos as United States citizens. (49.)

Response. Until modern times, the Navajos had no tribal-level political organization. Most important decision-making occurred at the extended family level. In response to increasing interaction with Anglo and Hispanic entrepreneurs and government entities, Navajo political structure and decision making processes became more complex. In the 1920s the U.S. Government appointed a council composed of prominent tribal leaders to approve mineral leases. Beginning in 1923, Navajo tribal councillors were elected. In 1934, as a result of the passage of the Indian Reorganization Act, a central Navajo administration was established at Window Rock. Over time, the growing volume of tribal business has resulted in the formation of numerous departments and standing committees, as well as the formation of local chapters, planning boards, grazing committees, etc. In addition, part of the Navajo response to increased energy resource development pressure has been to participate with other Native Americans in such large-scale organizations as the Council of Energy Resources Tribes (CERT).

A common tendency is for government agencies and large companies to interact with BIA or Navajo Nation officials when negotiating approvals for projects affecting Navajo lands or people. It is often the case that those Navajos most affected by proposed developments hold attitudes and opinions about the project that are not necessarily in accord with Tribal policies. Individual Navajos affected have been extended opportunities to express their opinions about the project through correspondence, interviews, chapter level meetings, and public meetings and open houses held in rural areas. In addition, PNM would have to negotiate easements with individual property owners prior to construction of any pipelines or transmission lines.

Comment. No estimate is given of the number of Navajos directly affected by the plant site and ROWs. What would the impacts be on individuals with grazing leases in the ROWs? (194, 428, 431, 449, 484, 534.)

Response. An estimated total of almost 20,000 Native Americans reside throughout the "checkerboard area" adjacent to the Navajo Reservation. Only one Navajo is actually living in the vicinity of the proposed generating station site.

Table 9-5 (p. 9-11) in the Social and Economic Conditions TR shows the estimated number of Navajos holding grazing licenses in 1982 in areas crossed by each alternative ROW: T1-274; T2-262; T3-133; T4-171; T5-18; P1-76; P2-63; and P3-66.

These figures provide a rough indication of the comparative numbers of Navajos affected by each alternative ROW. No Navajos would have to be relocated in order to accommodate the ROWs.

Economic impacts on land users because of short-term or long-term forage loss are described in the Vegetation TR. Forage losses associated with the water supply system are given in AUMs and dollars lost on TR pp. 4-23 and 4-24. Forage losses associated with transmission system are given on TR pp. 4-51 through 4-53.

Comment. The Navajo way of life would be disrupted. Drastic damage to the harmony of life as they perceive it would be caused by disturbing this environment and disrupting the Navajo relationship to land; important cultural features would disappear. The benefits to Navajos would not outweigh the costs. (232, 247, 254, 290, 444, 428, 461, 509.)

Response. Potential Unavoidable Adverse Impacts discussed in the Social and Economic Conditions TR include the following:

- Increased stress and concern about disruption of natural harmonies due to disturbance of sacred or supernatural areas by unknowledgeable people
- Perceived need for more frequent sponsorship of ceremonials and rituals to attempt to restore natural harmonies
- Acceleration of the rate of culture change and increased incidence of value conflicts
- Potential perceived need to relocate due to the altered nature of the environment and daily activities in the affected region.

These impacts refer to the potential cumulative effects of accelerated energy resource development activity in areas occupied by traditional Navajos. For further discussion of the combined effects of projects on Navajos, refer to the Cumulative Overview and the SJRRCL EIS.

Since it is difficult to quantify the NMGS-related costs and benefits to Navajos as a group, it is unreasonable to conclude whether benefits would outweigh costs or not. The likelihood is that some individuals would benefit from the project (primarily through employment opportunities) while other individuals would be adversely affected (adverse effects would result primarily from indirect impacts associated with an influx of non-Navajos to the area, as well as a reduction in opportunities to pursue traditional lifestyles - see Appendix D of the Social and Economic TR).

Comment. Fencing would cause major disruption to traditional Navajo lifeways. (416.)

Response. The NMGS proposed action would not necessitate fencing of grazing lands. While access to the generating station site itself would be controlled, ROWs for the proposed water pipeline and transmission lines would not be fenced. A very small amount of grazing land would be lost due to construction of support towers, but grazing use of the ROWs would not be disrupted.

Comment. Population increase in Farmington, Bloomfield, Aztec, and Crownpoint would put a strain on sewage treatment and solid waste disposal facilities in these communities. Sewage facilities in Farmington and Crownpoint are already operating at maximum capacity. Increased demand would mean upgrading or expansion at taxpayers expense. (437.)

Response. NMGS-related impacts on sewage treatment and solid waste disposal facilities in Farmington, Bloomfield, and Aztec are assessed in the Social and Economic Conditions Technical Report. No significant impacts were identified. Farmington's wastewater treatment plant, completed in 1981, has a capacity of 11 million gallons per day.

With the NMGS project, it was estimated that the capacity of this plant would be reached one year earlier than it would under baseline population growth conditions. Both Aztec and Bloomfield have sewage treatment capacities that should be adequate beyond the turn of the 21st century. Expansions needed to accomodate solid waste disposal in all three communities under baseline conditions which would be adequate to provide for the needs of the incremental increases in population projected to result from NMGS. Crownpoint's municipal services were not evaluated, since the analysis indicates it is unlikely that in-migrating workers would choose to reside there.

Comment. The EIS should have included information on state-level tax revenue and other economic benefits. (438.)

Response. The National Environmental Policy Act encourages assessment of potentially significant social and economic impacts from the perspective of the population residing in the directly affected region. Tax revenues from NMGS would be significant for an affected small community or school district. NMGS-related revenues would not contribute a substantial proportion of overall state revenues generated. For more information, refer to p. 4-11 of the Social and Economic Technical Report for the assessment of public finance impacts from NMGS.

Comment. Table 1-9, on DEIS pp. 1-41 shows projected tax revenues for each proposed alternative transmission line route. These figures, shown in 1993 dollars, should have been discounted to 1983 dollars. (457.)

Response. These numbers were generated for comparative purposes only, to provide relative levels and distribution of property tax revenues that could accrue to affected jurisdictions during the first year following completion of the facility. The estimates were made using 1981 tax rates, calculated in 1993 dollars based on a value of $757,000 per mile of transmission line. The differences in potential revenues shown are a function of the total length of the alternatives and the tax rates of the school districts crossed. For the purpose of these estimates, it was assumed that taxing authorities would choose to increase revenues rather than reduce tax rates.

Comment. Paragraph 2, line 3, on page 3-6 of the Social and Economic Conditions TR contains an error: 19,000 is not 31.6 percent of 34,000. (498.)

Response. Changes are provided in the Changes to the Text section for p. 3-6 of the Social and Economic Conditions TR in response to this comment.

Comment. The use of Farmington to show that few Indians would live in a new town may be faulty. The low Indian population of Farmington may be due to attitudes and prejudices toward Indians and would not necessarily mean that a town developed with a commitment to Indian needs and concerns would not have a larger percentage of Indians. (509.)

Response. Since the New Town is not part of the NMGS proposal, related impacts were discussed only generally in the NMGS EIS. Should a New Town be deemed feasible in the future, applications would be made for ROWs across public lands to provide the town with utilities and services. Such proposals would be subject to the full NEPA process, which would require detailed impact analysis based on a specific proposed action.

BLM's assessment does indicate that Navajo benefits from a new town in the Bisti area would be marginal. Farmington was used as an example because, compared to Gallup (which has a higher resident Navajo population), Farmington is a relatively new, resource development-oriented community. Navajo lifestyle preferences are not as easily satisfied in a new resource-oriented town as in a community like Gallup, with its long history as a reservation border town. Thus it is expected that Navajos working at the NMGS site would prefer to commute from their reservation allotments or predominantly Navajo communities like Crownpoint and Shiprock, rather than relocate to a new town

where living expenses would be higher and daily exposure to a large number of "outsiders" would be inevitable.

Comment. Why is the date of the arrival of the Navajo people in the Southwest shown as the 1500s rather than 1000 or 1100? (375.)

Response. Navajo migration to the Southwest is addressed in the Social and Economic Conditions TR (p. D-15):

> Exactly when the Navajos arrived in the Southwest is a matter of debate. Some evidence suggests they may have traveled southward along the eastern slopes of the Rocky Mountains as early as AD 700 (Van Valkenburg 1974, Kelly 1968). It is generally accepted that the Navajos reached the Southwest before AD 1500.

Comment. The DEIS acknowledges that three ethnic groups (Anglos, Native Americans, and Hispanic-Americans) predominate in the affected area, yet most of the text is devoted to addressing the specific concerns of Native Americans. Why are the effects on the other two ethnic groups ignored? (438-5.)

Response. The special attention given to impacts on Navajos is explained in detail on pp. D-1 and D-2 of the Social and Economic Conditions TR. It was recognized that the values and lifestyles of Native Americans were in some cases substantially different from those maintained by Anglo- and Hispanic-Americans in the region, as well as from those of the professional staff preparing the EIS. NEPA requires that potential impacts be assessed from the perspective of the affected population, and the American Indian Religious Freedom Act mandates federal government agencies to consider the effects of their policies and actions on opportunities for Native Americans to practice their traditional religions--which are interwoven with all other aspects of traditional culture.

It was felt that the impacts identified by technical staff preparing the EIS would reflect Anglo-American values and interpretations. Many of the Hispanic-Americans who currently live in and around Farmington have adopted urban-based lifestyles that would not be affected by NMGS in ways other than those identified in the main body of the Social and Economic Conditions TR. It was recognized, however, that special effort was warranted to identify impacts to Native Americans, whose values and lifestyles could be affected in unique ways by the proposed action.

Comment. It would be helpful to provide a table of NMGS population impacts by year and by community with a column depicting percentage increase over baseline population growth. (532-14.)

Response. Refer to Table 4-1 on p. 4-5 of the Social and Economic Conditions TR. This table shows population projections by community by year, and indicates percent change in population each year.

Land Use Controls and Constraints

Comment. Page 5-11 -- It would be helpful to include a discussion of the implications of the Navajo-Hopi Relocation Act on the NMGS project and possible New Town. There appears to be a potential conflict between land proposed for these projects and the disputed Navajo-Hopi land. (9, 160, 374, 374[a], 444, 484, 457, 509, 511, 532.)

Response. DEIS pp. 1-42 and 3-40 identified the potential conflict between the Navajo-Hopi Relocation Act and the proposed NMGS project from the Navajo perspective. If the lands were transferred to the Navajo Tribe they would no longer be under the jurisdiction of the BLM, and therefore action could not be taken by the BLM. At this time no action has been taken on the Navajo's application for the selection of the Bisti lands.

Comment. The Land Use Controls and Constraints TR, p. 1-9, paragraph 2, states that the transmission line rights-of-way (ROW) would support compatible land use such as grazing. The next sentence says the ROW would be closed and patrolled by helicopter. (498.)

Response. Only temporary access roads to the ROW would be closed after construction; compatible uses such as grazing would be permitted to continue.

Comment. Comment stated that the proposed action conflicts with New Mexico Statute 19-15-2 NMSA 1978. (478.)

Response. All public lands in New Mexico administered by the BLM continue to be held in federal ownership despite the claim contained in 19-15-2 NMSA 1978, and the existence of this statute poses no conflict with the proposed actions.

Comment. The DEIS should indicate the variety of conflicts with BLM's land-management objectives that the Ute Mountain Land Exchange proposal represents. The San Juan Chaco Management Framework Plan (MFP) Update for Coal stated that the land exchange conflicted with preservation of the Fossil Forest, range improvement, preservation of cultural resources on the exchanged lands, grazing, and preservation of religious sites. The MFP states that eight families live on lands selected for inclusion in the Ute Mountain Land Exchange, and the Ute Mountain Environmental Assessment states that nine small ranching operations would be wiped out by the exchange. Why is information on these impacts not in the DEIS? (484.)

Response. The MFP and Ute Mountain Land Exchange Environmental Assessment addressed the approximately 30,000 acres of public lands then being considered for exchange. The acreage currently under consideration (7,845.31 acres) does not include the Fossil Forest, or occupied residences. The scale of impacts to cultural and grazing impacts is thereby reduced.

Comment. A history of land issues in the area would be a great addition to all these EISs, and would put local and Tribal views on these projects into perspective. How did Indian quarter-section allotments come to be included in the Paragon Ranch grazing allotment? How did white people come to get the two grazing allotments (Tsaya and Black Lake) involved, and sell them to Paragon Ranch? When did Paragon Ranch acquire them? Are there "unauthorized" dwellings on the Paragon Ranch? (484.)

Response. The Navajo land claim and Navajo-Hopi Relocation selection are discussed in the Comment and Response section under Procedural. Further information on the questions concerning ownership of allotments can be obtained from the BLM Farmington Resource Area Office.

There are no occupied residences on the public lands currently under consideration for the Ute Mountain Land Exchange and no "unauthorized" dwellings on Paragon Resources, Inc., allotment.

Procedural Comments

Comment. The structure of the EIS is biased in favor of the action preferred by BLM. The NMGS EIS conducts a complete analysis only of the proposal preferred by BLM. (17, 497.)

Response. The proposed action addressed in the NMGS DEIS is that of the applicant, PNM, because the EIS is being done in response to ROW applications. In addition, the DEIS analyzed numerous alternatives (see DEIS Chapter 1). The preferred alternatives (for BLM's authorizing actions) which were selected by BLM do not conform with those proposed by PNM. See the discussion of the Agency's Preferred Alternatives in the FEIS summary.

Comment. EHV transmission lines to the proposed Rio Puerco Substation near Albuquerque should be selected so as to offer the least negative impact to CCNHP and other WSAs. It is not sufficient that preferred alternatives are shortest in length, most economical, or offer the least denial of strippable coal resources. The discussion of alternatives and the preferred action should more fully discuss environmental trade-offs. Alternative T1 or T4 might then be preferable in this light. (266.)

Response. Environmental and economic factors were considered in the analysis of project component alternatives. Distance, number of miles following existing ROW, and miles crossing strippable coal were listed on p. 1-42 of the DEIS because they are important factors in the analysis of transmission line alternatives, not because they were the only factors considered. For a discussion of potential impacts to CCNHP and WSAs refer to pp. 3-36 and 3-38 and Table 3-7 of the DEIS; pp. 4-7 through 4-11 of the Visual Resources TR; and pp. 4-4 through 4-5 of the Wilderness Values TR.

See the discussion of the Agency's Preferred Alternatives in the FEIS Summary.

Comment. The EIS documents do not contain sufficient information about the BLM's plans for mitigating the impacts of the proposed activities. The agency has decided to defer the development of mitigation and protection measures to a later date. This cuts off public input into this important decision-making process and makes it impossible to determine what the ultimate environmental impacts of the proposed action would be. (52, 109, 438, 444, 457, 496, 497, 498.)

Response. Suggested mitigation measures were identified on pp. 3-52 through 3-59 of the DEIS. These measures were compiled by BLM with contributions from many of the 21 cooperating agencies. Chapter 3 of the DEIS discloses the anticipated impacts which would result from the proposed action. Any mitigation which would be required would lessen these identified impacts. Public input has been solicited throughout the 3-year environmental assessment process. Three sets of public meetings were held in January 1981, March 1982, and December 1983; in addition numerous other meetings were held with special interest groups and most of the Navajo Chapters in the checkerboard area. For additional public involvement see the preceding sections of Chapter 4 of the FEIS. Mitigation measures for which BLM has jurisdictional control (ROW Grant) will be specified in the public Record of Decision and by stipulation to the ROW Grant. Other federal agencies may require mitigative measures through their permitting processes.

Comment. The EIS fails to adequately address the impact issues of basic concern to the Navajo people, nor does it comply with certain requirements such as the mandate for a regional Environmental Impact Statement, as in the case of proposed developments in the San Juan Basin region. (374[a], 420, 484.)

Response. Appendix D of the Social and Economic Conditions TR is a 68-page appendix especially addressing Native American concerns and potential project impacts on traditional Navajo lifestyles and values. This analysis is based on an extensive survey of relevant secondary sources (including ethnographic surveys, agency reports, recent research, impact studies, field interviews, reports, and transcripts from the public meetings). The Navajo Tribe and BIA have been cooperating agencies throughout the development of the DEIS and have been involved in preliminary reviews of all documents before these documents were released to the public.

The interactive impacts of the combined proposed projects addressed in the SJBAP (administrative and organizational plan to prepare the environmental impact statements) were the subject of the CO which was released on November 30, 1982, with the draft EISs. This document assesses the significant interactive cumulative impacts of all the proposed actions of the two EISs (SJRRCL and the Bisti, De-na-zin, and Ah-she-sli-pah Proposed Wilderness Areas).

Comment. Who would get the land when the plant is decommissioned? (92.)

Response. If PNM acquires the land through an exchange or sale with the BLM, then the land would become private land and would remain in their ownership when the plant was decommissioned. If PNM acquires use of the land by ROW grant or lease, the land would revert to BLM ownership once the plant was decommissioned.

Comment. A number of comments expressed the desire that the FEIS be suspended, that additional studies be conducted, and that the FEIS not be completed until the need for NMGS is established. (3, 10, 24, 133[a], 451, 458, 478.)

Response. No legal or procedural grounds have been established nor has any new information been brought to light since the issuance of the DEIS which warrant withholding the FEIS. Furthermore, approximately 30 permits (see DEIS Appendix F) would be required in order for PNM to construct the NMGS project and, therefore, additional data would become available and be analyzed throughout the continuing permitting process. The preferred alternative is to issue BLM permits once other necessary permits for the construction and operation of NMGS are obtained by the applicant. This gives added opportunity to consider any new information that may arise.

Comment. Several comments mentioned that the Navajo and Jicarilla tribes have claims on water rights, both surface water and ground water. Are the companies entitled to the water claimed by the tribe? (125, 133[a], 175, 374, 420, 444, 451, 457, 511.)

Response. The DEIS analyzes the environmental impacts of both the proposed water source (San Juan River) and the alternative (wellfield ground water). As the comment notes, there is uncertainty as to whether either of these sources would be legally available because of the pending San Juan Basin water adjudication suit, and other applications for water rights permits and litigation related to the use and appropriation of water in the basin, such as those filed by the Navajo and Jicarilla tribes. The end result of the litigation may preclude use of one or the other of these water sources for NMGS. Unresolved litigation is not a factor in the analysis of a proposed action and it is inappropriate to speculate as to the outcome of the litigation. However, availability of a water source will be considered in the decision-making process.

Comment. Several comments expressed concern that the implications of the Navajo land claim to 2 million acres in northwest New Mexico are not addressed, and that the land claim may invalidate the BLM plans for the San Juan Basin. (24, 45, 90, 115, 118, 125, 133, 164[a], 175, 374, 374[a], 420, 450, 451, 457, 484.)

Response. The comment correctly notes that the Navajo Tribe has filed a lawsuit claiming that it owns approximately 2 million acres of land in northwest New Mexico. The Navajos' claim extends to all of the land involved in the proposal. To date, the Navajo Tribe has not sought, and the court has not issued, any orders which would prevent the BLM from approving the proposed action if it chooses to do so. The existence of the lawsuit is noted in the EIS and will be considered by the decision-maker when he decides whether to approve the proposal. The EIS cannot, however, identify the environmental impacts which would occur if the suit were to be successful because the possible uses are too remote and speculative to allow meaningful analysis. The Navajo Tribe could, if it gained title to the land, approve all of the pending proposals with greater or lesser terms to protect the environment. Alternatively, it could reject all the pending proposals or take actions in between these extremes.

Comment. A true regional EIS must be prepared to study the cumulative and synergistic impacts of all these actions. See Kleppe vs. Sierra Club 79L Ed. 2d 576. (117, 374, 374[a], 450, 478.)

Response. BLM is studying the cumulative effects of the pending proposals, but it is not doing so in the form of a "regional" EIS. Nor is it required to do so in that form, because there is no regional plan proposed. The BLM's analysis of the pending energy and wilderness-related proposals in the San Juan Basin fully complies with NEPA, including any requirements for analysis of cumulative effects described in Kleppe vs. Sierra Club, 427 U.S. 390 (1976). NEPA requires a federal agency to consider cumulative impacts of related proposals. It also requires an analysis of the impacts of a proposal for a regional plan or program if one exists. Although no regional plan or any proposal for a regional plan or program exists in the San Juan Basin, there are several separate but interrelated proposals pending before the BLM. The BLM developed the San Juan Basin Action Plan as an administrative and organizational approach for preparing EISs on the pending proposals. The proposals are NMGS, competitive and PRLA coal leasing, and wilderness area proposals. The BLM chose to study the environmental impacts of these pending proposals by: (1) preparing an Environmental Impact Statement on each proposal; (2) preparing a Cumulative Overview to study the cumulative effects of the proposals; and (3) by circulating the documents together to allow coordinated agency and public review. To facilitate this review, the draft SJRRCL and NMGS EISs each contained a summary of the cumulative impacts, and the FEIS contains any changes made to the Cumulative Overview as a result of comments, and the responses to comments made on the Cumulative Overview. In Kleppe vs. Sierra Club, 427 U.S. 390, 410 (1976), the court said that when proposals "that will have cumulative or synergistic environmental impacts upon a region are pending concurrently before an agency,

their environmental consequences must be considered together." This is exactly what was done here. The structure and format allows efficient use of BLM and public resources and ensures that a hard look will be taken at impacts of the pending actions which have related or connected effects. The procedures result in a full and fair look at the proposals with no intent of minimizing their cumulative effects through segmentation or separate consideration. The proposals are, as Kleppe vs. Sierra Club requires, being considered together.

Comment. A long section of the DEIS is entitled "Applicant Committed Practices." The title is misleading. There is no legal commitment from PNM to do any of the things described.

The net effect of a three-page list is that there is virtually nothing that PNM must do even if it is willing to do it. (457.)

Response. The applicant-committed practices have, in fact, been committed to by PNM. This is on record in the case file for this project (NM 30840) available for public review and inspection at the BLM New Mexico State Office in Santa Fe.

Should the proposal be approved, these practices would become stipulations to BLM rights-of-way (ROW) grants and other BLM authorizing actions for the use of public lands. Failure to comply with the grant stipulations could result in revocation of the grant.

Comment. The DEIS provides a list of cooperating agencies, some of which reviewed technical reports but did not provide comments. Such a role for a "cooperating agency" is not the intent of the CEQ regulations.

These agencies had no significant influence on BLM's analysis or conclusions nor can BLM claim that the N.M. Public Service Commission has had any significant role in the analysis of need. (484.)

Response. The CEQ regulations do not specify the amount of input or involvement necessary for a cooperating agency (40 CFR 1501.6). As stated on the back of the title page, formal cooperating agencies entered into signed agreements concerning preparation of the EIS, which included agreement as to the involvement necessary by the cooperating agency to meet the statutory and jurisdictional requirements of both agencies. A lack of formal response to the review of the TRs is not indicative of a lack of analysis or involvement on the part of any agency; in many cases, it indicated that the agency did not have any comments. The NMGS case file (NM 30840) clearly documents the involvement of cooperating agencies throughout the environmental analysis process. (This case file is available for public review and inspection at the BLM NMSO.) Additionally, the reference sections of the DEIS and TRs give an indication of the amount of material provided by various agencies and used in the preparation of the EIS. The NM Public Service Commission has been involved as a cooperating agency throughout the process. Several meetings were held with the PSC to discuss their role and concerns, and all draft reports were provided for their review and comment. The lack of written comments should not be construed as lack of involvement.

Comment. Woodward-Clyde Consultants subcontractors included a PNM employee (DEIS p. 4-8). Applicants are not supposed to participate in writing DEISs for their own projects.

Contributors to the DEIS included PNM staff (DEIS p. 4-9). (457.)

Response. Nothing in the regulations restricts applicants or their employees from submitting material for use in an EIS prepared by a federal agency (CEQ regulations, 40 CFR 1506.5[c]. Useful ethnographic interview materials were contributed to the cultural resources analysis by the PNM employee.

Comment. Not discussing "need for power" makes an intelligent analysis of generation or conservation alternatives impossible. The DEIS ignores both the issues of need and water allocation, though they were identified as major issues during the scoping process. The DEIS also must address appropriate air

pollution mitigation. The fact that another state or federal agency may later have to deal with a certain issue does not waive the lead agency's need to discuss it in an EIS. (271, 457, 484, 496.)

Response. Need for power is addressed on DEIS pp. 1-1 to 1-4 and supported by a 178-page TR, and technological alternatives were addressed on DEIS pp. 3-49 to 3-52, supported by a 105-page TR. Water was also addressed in the DEIS (pp. 2-30 to 2-31 and 3-28 to 3-32) and supported by a 360-page TR. Air pollution control options were presented on pp. 1-15 and 1-16 of the DEIS. Impacts were analyzed in Chapter 3 based on "worst-case emissions," i.e., the highest emissions that would result from any of the control technologies that could be used.

All of these issues have been addressed in detail and the necessary permits which relate to these issues have been listed in the EIS, Appendix F. Environmental Impact Statements are disclosure documents addressing the impacts of a proposed action, not decision documents. Decision documents follow an EIS in time and may use other information in addition to the EIS to supplement decisions.

Comment. The decision should be delayed, since the project is not now needed and preparation of an EIS 12 years in advance is not within NEPA compliance, since it cannot consider advances in power generation technology, as well as the site, coal supply and air pollution control alternatives which may become available within the next decade, and which may be essential to a reasonable choice as defined by NEPA. (133, 133[a], 199, 247, 273, 284, 435, 444, 457, 458, 478, 484, 496.)

Response. Revised information concerning the need for the project has become available since the issuance of the DEIS, and the factors mentioned in this comment are all important issues which the decision-maker must consider when deciding whether to approve or deny the applicant's ROWs applications. If it is not in the public interest to commit resources at this time, then the decision can be delayed. However, it is still proper to prepare an EIS at this time in response to an application and to determine the action to be taken, which could be denial.

Comment. I feel that the EIS should be done by an outside firm and not Woodward-Clyde Consultants which works for PNM. BLM omits the fact that it has no contract with WCC and that WCC has previously worked for PNM. CEQ requires a disclosure statement that clearly states the scope and extent of the firm's prior involvement. (11, 420, 457, 496.)

Response. The EIS (Preparers section) has been revised to include information on WCC's past work in similar arrangements with BLM and past work for PNM. WCC was selected to prepare this EIS as a result of a selection process solely under the control of BLM in accordance with third-party contract procedures. In accordance with standard BLM procedures and the CEQ Regulations (40 CFR 1506.5(c)), WCC has been paid by PNM to prepare the NMGS EIS under the guidance of BLM. BLM is solely responsible for the scope and content of the EIS. WCC has executed a disclosure statement as required by the CEQ regulations. This information is documented in BLM case file NM 30840, available for public review and inspection at the BLM NMSO, Santa Fe.

Comment. Applicable Navajo controls and standards for the development activities will be established and enforced as such standards are developed; these include but are not limited to water codes, safety codes, environmental codes, resource management codes, housing standards, air quality standards, relocation policies, compensation standards and procedures, mining and reclamation regulations, various environmental impact mitigation measures and procedures like sacred sites, grave sites, and archeological sites, preservation and relocation or salvage procedures, etc. Until such codes or standards are developed, compliance with state or federal laws or regulation will be necessary. (444.)

Response. If BLM issues a ROW grant for use of public lands for construction of the water supply and transmission systems, a standard stipulation would be included which requires compliance with applicable federal and state

laws and regulations. The applicant would further be obligated to comply with local controls (e.g., Navajo Tribe) for which the local entity has legal jurisdiction.

Comment. The government should control the speed of development to control the effects on Navajo culture. The influx of non-Navajos would deprive Navajos of control over the significant aspects of their lives (such as education, medicine, law, government representation). The BLM needs to develop a plan for the area, including such resources as paleontology, archeology, wilderness, etc. (420, 444.)

Response. Considerable control over the speed of development in any area is inherent in NEPA and FLPMA, particularly in the requirements for environmental analysis which consider social and economic effects of federal actions as well as mitigation, and in federal land use planning which must be based on the principles of multiple use and sustained yield. The public participation process for BLM planning and environmental analysis actions provide a clear avenue for the development of public attitudes and opinions which can have a restraining effect on rapid development. The formal cooperative agreements or memorandums of understanding between BLM, BIA and the Navajos (and other Native American groups) clearly establish a viable method for these groups to have a positive effect in controlling significant impacts to Native Americans throughout the environmental analysis and decision-making process.

To date, BLM has completed the following actions:

(1) Comprehensive land use planning (Management Framework Plan [MFP], Chaco Planning Unit; BLM, Farmington Resource Area Headquarters and Albuquerque District Office, 1981).

(2) Executed five Memorandums of Understanding and seven Interagency Cooperating Agreements in regard to the San Juan Basin proposals (NMGS, Coal, and Wilderness).

(3) The Draft EISs (including public review and comment) for the major San Juan Basin proposals, including a cumulative analysis.

(4) Twelve informal surface owner consultation meetings throughout the area to ensure that Native American concerns are fully covered in all the environmental analyses performed for San Juan Basin proposals.

Other (local) land use controls are in the purview of state and local governments.

Comment. The document made no mention that federal land is to be used as multi-purpose land. The documents imply that all federal land held in trust by BLM should be used for recreational purposes and not for ranching or mineral development. Specific government regulations defining the scope of the BLM as a management agency for the multi-use of land should be stated in the introduction of each document. (438.)

Response. Comprehensive land-use planning for public lands, based on the concept of multiple use, is required by the Federal Land Policy and Management Act (FLPMA) of 1976 (P.L. 94-579). See Title 1, Section 103(c) and Title II, Section 202(c), which require coordinated land-use allocations for all public land resources as well as objectives and constraints for each resource and support activity. This information is included as part of the Introduction to Chapter 1. Land use planning for public lands in this area has been completed (Management Framework Plan [MFP], Chaco Planning Unit; BLM, Farmington Resource Area Headquarters and Albuquerque District Office, 1981).

Comment. Withdrawal of land for the proposed generating plant without prior consultation constitutes a breach of the "Cooperative Agreement." Furthermore, said proposed withdrawal of land by BLM for a generation station would not serve Navajo interests and is without statutory or regulatory authority. It is also contradictory to the Navajo selection pursuant to the Navajo-Hopi Land Settlement Act. (164, 532.)

Response. In recent months, several meetings involving PNM, the Navajo Tribe, and the BLM have been held in an effort to resolve the potential problems of competing interests.

As part of the settlement of the century-old land dispute between the Navajo and Hopi tribes, the U.S. Congress authorized the Navajos to select 35,000 acres of land in New Mexico within 18 miles of the reservation boundary (P.L. 93-531, 96-305). The land selected is to be the home of Navajos relocated from the former Joint-Use Area. In July 1982 the Tribe selected lands that include the proposed NMGS site.

As stated in the planning decisions, BLM has proposed to make these lands available to PNM for the proposed generating station, and ancillary facilities. In March 1982 BLM proposed that the lands be withdrawn "subject to valid existing rights, from appropriation under the public land laws, including the mining laws.... The purpose of the proposed withdrawal is to protect the lands in aid of a proposed exchange with the Public Service Company of New Mexico" (Federal Register 1982).

From a Navajo perspective, use of the land for the proposed action or alternatives could be perceived as a potential conflict with Navajo tribal plans and policies for use of these lands, in that this would preclude their option to acquire these lands for land dispute settlement purposes.

These actions are in full compliance with the cooperative agreement between BLM and the Navajo Tribe dated September 15, 1978, and updated in 1982, dealing with land and grazing administration of the "off-reservation checkerboard area." Efforts to arrive at an amicable solution are ongoing.

Comment. Table 2-7 on p. 2-18 of the DEIS describes visual impacts for landscapes occupied by project components. The BLM fails to include the associated coal mines to supply NMGS as "project components." These mines are not discussed in the Leasing EIS, because BLM claims these mines would be on existing leases (p. S-1). The BLM cannot claim it is exempted from discussing the mines simply because they are not part of PNM's permit application. The power plant itself is not part of PNM's application, only the associated rights-of-way. The power plant is a proposed end use of the Ute Mountain Land Exchange. But NEPA requires the BLM to consider all the environmental effects associated with the proposed action, and those effects include not only the operation of a power plant but also the procurement of fuel for it. (457.)

Response. The associated coal mines are either existing mines, or mines under existing leases or pending PRLAs, and are therefore covered by completed environmental analysis or will be covered by analyses prepared by OSM at the mine plan stage. NEPA and the CEQ regulations stress the avoidance of duplication; therefore, no additional analysis was required for this subject in the NMGS EIS and NMGS has been tiered to other EISs which specifically discussed these coal sources. For the purposes of visual resource analysis, the mine adjacent to NMGS was assumed and considered as part of the baseline. Approximately 9 million tons of coal annually (worst case) would be required for NMGS. This is equivalent to approximately 600 acres of surface disturbance per year.

Comment. BLM has not stated its preferred alternative in sufficient detail. BLM should condition its permits with the provision that the applicant obtain all other necessary permits. (478, 484.)

Response. The BLM New Mexico State Director has the authority to issue all land use grants, permits, and amendments for public lands in New Mexico. The decisions which the BLM State Director has to make based on this EIS are whether or not BLM would provide use of the proposed or alternative lands for the planning corridors for transmission lines and pipelines. It was for these decisions which the BLM stated a preferred alternative. As stated on DEIS p. 1, issuance of these permits would be contingent on the applicant's receipt of the other necessary permits. As was stated on DEIS p. 1-42, BLM's selection of a preferred alternative was based on the impact analysis in Chapter 3 and the comparison of alternatives in Tables 1-7, 1-8, and 1-9. A sum-

mary of the reasons for these selections was also given on DEIS pp. 5-10 and 5-11.

Comment. The narrative does not make it clear what the basis for the distinction between direct and indirect impacts is. (498.)

Response. The definitions of the two types of effects (impacts) are taken from the Council on Environmental Quality (CEQ) Regulations (40 CFR 1500-1508) implementing the National Environmental Policy Act. The CEQ definitions are: "Direct effects which are caused by the action and occur at the same time and place," and "indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable."

Comment. The document is not readable by the average citizen, which makes the public participation and review process inadequate. (110.)

Response. The NMGS EIS deals with a highly technical and complex proposal which is in itself interrelated with other proposals in the San Juan Basin. A document's organization and written text cannot completely remove the complexities of the proposal, but every effort has been made to clearly display the potential environmental effects of the proposal, particularly in the summary and tabular displays. Most highly technical material was included in the TRs, with only extracts or summations included in the EIS itself in order to reduce the size and improve the readability of the document wherever possible.

The publication of an EIS and its distribution to the general public is only one facet of the public participation process for an environmental document. The EIS is also reviewed by other federal agencies, state and local agencies, interest groups, professional organizations and others with the technical expertise necessary to review a proposal and its potential effects in depth. (In many cases, review and comment by agencies with jurisdiction and/or expertise is mandated by law.)

The scoping meetings, informal open houses, formal public hearings, and other meetings held specifically on this proposal also provide a forum for clarifying the size, scope, and effect of the proposal for the public.

Comment. Commenter suggested use of word "hobbyists" vice "non-professional hobbyists" on page 3-17. (498.)

Response. See changes on FEIS p. 3-19 in response to this comment.

Comment. The commenter suggested indexing the EIS and related documents and suggested a list of abbreviations and acronyms be included, preferably at the front of the EIS. (478.)

Response. The DEIS was indexed following the reference section (see DEIS p. In-1). Indices in EISs are a requirement of the CEQ Regulations (40 CFR 1502-10). Abbreviations and acronyms were defined with their first usage in the DEIS text, and were given on pp. G-10 and G-11 in the DEIS.

Comment. The actual distance between the NMGS site and the Bisti WSA is 1 mile, vice 2.1 miles as stated in the DEIS. (457.)

Response. The distance between boundaries of the NMGS project site and the Bisti WSA is approximately 1 mile. However, the distance between the proposed plant facilities for NMGS and the boundary of the Bisti WSA is approximately 2 miles. See FEIS pp. 2-22 and 3-7 in response to this comment.

Comment. PNM has announced plans to build a billion-dollar industrial plant in conjunction with NMGS to recover aluminum from fly ash. It has had aluminum mining claims staked in the Bisti area since at least 1981, so the idea is not new. The DEIS omits any mention of this major industrial project which is dependent on NMGS, would be physically interconnected with it, and would presumably have significant environmental and socioeconomic effects of its own. This violates the legal requirement that an EIS identify "reasonably foreseeable" consequences of proposed projects. (457.)

Response. Other possible industrial end uses of the Ute Mountain Land Exchange include an aluminum plant. See FEIS p. I-7.

However, conventional impact analysis of a proposed action is based on existing conditions, rational projections of these conditions into the future (see Baseline 1 and 2), and new actions or projects that are clearly entrained in a development cycle. An aluminum recovery plant did not meet any of the criteria used to define reasonably foreseeable projects.

Purpose and Need

Comment. PNM's stated purpose, "to assess the benefits and risks of developing a coal-fired generating station," is false. PNM has applied for permits; it is not just studying the relative merits of alternatives. (457, 484.)

Response. As was stated on DEIS p. 1-1, PNM's purpose is to assess the benefits and risks of developing a coal-fired generating station, which includes determining the feasibility and availability of acquiring such resources as land, water, and fuel. The applications for exchange and ROWS are the mechanisms that triggered the preparation of the Ute Mountain Land Exchange EA and the NMGS draft EIS to determine feasibility and availability of acquiring land.

Comment. The BLM is letting PNM mislead it by reprinting the quote "PNM states that it 'believes (the strong growth scenario) is the realistic scenario upon which to develop prudent long-term system expansion plans...'" In fact, PNM does not base its long-run expansion forecasts on a "strong growth" scenario but rather on its main forecast. (266, 457.)

Response. PNM's planning process is reviewed in the Purpose and Need TR (Section 4.0 and Appendix A). PNM prepares an official 10-year forecast of the future electrical needs of its customers on an annual basis. This forecast is then extended to 20 years, and alternative scenarios of electrical need growth are developed to assess the sensitivity of supply expansion alternatives to changing economic and fuel price parameters.

PNM recently stated (letter to Leslie Cone, BLM, from Dan Peck, Manager, Environmental Affairs, PNM, May 27, 1983):

> PNM is not attempting to justify the building of a new power plant based upon any single load forecast. PNM has identified that within the possible ranges of forecast, NMGS may be required to meet system needs in the 1990s.
>
> Further, part of NMGS may be required by other New Mexico utilities and if it is deemed beneficial to New Mexico ratepayers, joint participation (power sales, ownership, etc.) with out-of-state utilities may also be considered.
>
> It has been standard practice for the NMPSC to wait for a satisfactory Record of Decision on an EIS, as well as requesting that PNM define the fuel source, water availability, an adequate site, and demonstrate a need for the power prior to considering PNM's request to license a new generation facility. It is at that point that PNM testifies to the most likely load forecast which exists at that time. That forecast must be within the envelope identified in the EIS. If the forecast is higher, PNM will be able to construct the facility in time to meet the need, assuming the EIS and other permits have been obtained. If the forecast is below the low range of the envelope, PNM will presumably not request NMPSC approval.
>
> If the time frame for building the project is delayed significantly beyond the time frames analyzed, new analysis may be needed before permits could be approved.

Comment. Because of PNM's reserve criteria, it would be impractical for PNM to install a 500 MW coal unit without joint participants. (133, 133[a], 457.)

Response. PNM states (letter to Leslie Cone, BLM, from Dan Peck, PNM, May 27, 1983):

> The 1983, G.O.33 filing with the New Mexico Public Service Commission states it impractical for PNM to install a 500 MW coal-fired unit without joint participants. This comment was with respect to present resource levels, not

with resource levels that PNM will have when NMGS is needed to meet New Mexico loads. Additionally, PNM currently owns most of an approximately 500 MW unit without increasing its required reserve margin due to hazard sharing agreements with other utilities. Such arrangements, should they be required, would be available for NMGS. The option to have participants in NMGS provides planning flexibility required by the uncertainties of future resource requirements.

Comment. The forecasts of PNM's electrical needs in the DEIS and the Purpose and Need TR are out of date, and PNM has more recent forecasts available. Specifically:

1. PNM's contract with Southwestern Public Service Company (SPS) to purchase 200 MW, at up to a 95 percent capacity factor in 1995 - 2011, is omitted.

2. PNM keeps reducing its forecasts as time goes on.

3. PNM's appendix to the Purpose and Need TR (Appendix A) is out of date.

4. The Bureau of Business and Economic Research's latest growth forecast is lower than the earlier forecast used as a basis for projecting electrical needs in the DEIS.

5. Natural gas prices have not been increasing as quickly as assumed in the DEIS analysis.

6. The EIS should mention PNM contracts throughout the 1990s to purchase power from El Paso Electric.

7. The forecasts include New Mexico Electric (in Hobbs, New Mexico) but this will not be part of the PNM system. (27, 52, 133, 133[a], 168, 254, 273, 319, 396, 409, 420, 457, 458, 478, 484, 491.)

Response. PNM has provided BLM with their latest forecast information. This has been included in Appendix E and has been incorporated in the FEIS. Changes are provided on FEIS pp. 1-2 and 1-4 where PNM's updated load forecast is presented.

1. Figures 6-1 through 6-4 and Appendix B of the Purpose and Need TR do not reflect the revised numbers provided by PNM for Tables 6-1 and 6-2.

2. With regard to the revised forecasts:

   a. The contract with SPS is included.

   b. The forecast projects a lower need for power in the future than the forecast included in the DEIS.

   c. PNM has not provided an updated version of Appendix A to the Purpose and Need TR; however, the revised material provided does update the forecasts in that appendix.

   d. PNM's revised forecast was based on the information from the Bureau of Business and Economic Research and the latest information available on natural gas prices at the time.

   e. No contracted purchases from El Paso Electric are included in the forecast.

   f. The forecast does not include New Mexico Electric.

Comment. References for the Purpose and Need and Alternatives TRs have not been made available by the BLM in response to Freedom of Information Act requests. (484.)

Response. Southwest Research and Information Center initiated a Freedom of Information Act request to the NMSO BLM by letter dated May 17, 1982. BLM provided the requested information by letter dated June 11, 1982, with 2 exceptions: 1) items which did not exist, and 2) the materials pertaining to PNM's analysis of needs for NMGS. This material was

preliminary draft material consisting of opinions and recommendations forming a part of the deliberative process in agency decision-making. As such, the material was withheld pursuant to exemption (5) of the Freedom of Information Act (5 U.S.C. 552(b)(5)). An appeal to the Secretary of Interior was filed on September 1, 1982. The appeal was denied.

Southwest Research and Information Center filed a second request under the Freedom of Information Act on September 13, 1982. All information contained in this request was provided to SRIC with 3 exceptions: 1) material which did not exist, 2) material which BLM did not have, and 3) information which was part of the deliberative process and therefore could legally be withheld.

However, once the DEIS was published all background and supporting documents were available to the public. No additional requests for this information have been received.

Comment. "It is certainly not historical PNM practice to use any forecast other than its official one in permitting cases. In testimony before the New Mexico Public Service Commission regarding participation in San Juan 4 (case 1452), the BACA Geothermal Generating Plant, its general long-run planning (case 1577), NMGS (case 1693) and the proposed Eastern Interconnection (case 1794), PNM has always relied on its official forecast." (133, 157, 167, 273, 457, 478, 484.)

Response. PNM states in a letter to BLM dated May 27, 1983, that:

> PNM is not attempting to justify the building of a new power plant based on a single load forecast. PNM has identified that within the possible range of forecasts, NMGS, a base loaded, coal-fired, [sic] generation station, may be required in the 1990s.... Before PNM expends the type of capital outlays required for this facility, it must demonstrate to the NMPSC that the need is justified. It is at that point that PNM testifies as to the most likely load forecast which exists at that time. That forecast must be within the envelope identified in the EIS. If the forecast is higher, PNM will be able to construct the facility in time to meet the need, assuming the EIS and other permits have been obtained. If the forecast is below the low range of the envelope, PNM will not request NMPSC approval.

Comment. Does PNM propose to export NMGS electricity to California or any other state outside of New Mexico? (273, 356, 396, 491.)

Response. PNM's statement of purpose for NMGS was included on DEIS pp. 1-1 to 1-4, and Section 4 of the Purpose and Need TR. This statement does not propose export of power out of New Mexico. The analysis of need presented in the Purpose and Need TR is based on the assumption that all four 500 MW units would be used to serve need in New Mexico. However, PNM has stated that if it is deemed beneficial to New Mexico rate payers, joint participation (power sales, ownership, etc.) with out-of-state utilities may also be considered.

Comment. The electrical demand growth projected by PNM in the DEIS is greater than what is projected to occur in the rest of the country. (119.)

Response. PNM projects that its future electrical demand growth rate will be considerably higher than the national average (Public Service Company of New Mexico, "Conservation Plan of Public Service Company of New Mexico, For Compliance with NMPSC General Order 33," January 1981, p. 10, and Public Service Company of New Mexico, "Description of the Proposed Project, New Mexico Generating Station," Revision 1, July 24, 1981. See the Purpose and Need TR, p. B-61, for a review of PNM's historical demand growth.

Comment. DOE power needs would be less than projected in the DEIS. DOE expects to reduce peak purchases from PNM to 22 MW in 1990 with potential reduction from a 6 MW hydroelectric plant at El Vado. (478.)

Response. PNM's August 1982 load growth document shows sales to DOE of 24 MW in

1982 growing to 34 MW in 1990. If this were reduced to 16 MW the total savings to PNM could be as much as (34-16) 1.2 = 15 MW if a 20 percent reserve margin is included.

Comment. It is not accepted practice to use a higher than nominal growth scenario in utility system expansion planning. PNM should use its nominal 20 year forecast for the EIS. (133, 167, 273, 457, 478, 484.)

Response. PNM's planning process is reviewed in Section 4.0 and Appendix A of the Purpose and Need TR. PNM states (Public Service Company of New Mexico, "Description of the Proposed Project: New Mexico Generating Station," July 24, 1981) that "PNM believes (the strong growth scenario) is the realistic scenario upon which to develop prudent long-term system expansion plans which afford PNM the ability to meet the energy requirements of an economically strong New Mexico economy." See also the responses to previous Purpose and Need comments.

Comment. Building large power plants results in high rates for electricity which tend to reduce demand, requiring even higher rates, resulting in what Amory Lovins describes as a "spiral of impossibility." (229.)

Response. The latest forecast of future electrical power needs provided by PNM is included in Appendix E. PNM's treatment of changes in demand for electricity in reponse to rate changes in its forecasts is described in Appendix B of the Purpose and Need TR.

Comment. Is the need for the facility generated by the employment created by the facility? (11.)

Response. The employment created by the facility is discussed in the Social and Economic Conditions TR. Table 4-1 of this report indicates a total population increase due to NMGS of 2450 persons during the operation period of the plant. Four 500 MW units would generate 11,388 GWh/yr. PNM's 1981 forecast indicated that in 1996 its strong growth scenario would require 13,147 gwh in base sales plus losses to serve a population of 903,865, implying a consumption of .015 gwh/capita. Thus, at this rate of consumption, NMGS could potentially serve a population of 760,000.

Comment
The projections on the chart (Figure 1-1) on DEIS p. 1-3 were done by a consulting firm affiliated with PNM. I would like to see independent confirmation of these need estimates before I would be convinced of need.

Response. First, these estimates are those of PNM, as was stated on DEIS p. 1-2. These estimates have been revised by PNM as was previously discussed in this FEIS. The estimates will be scrutinized at the time PNM applies to the NM Public Service Commission for a Certificate of Public Convenience and Necessity (see DEIS p. F-3, and changes provided on FEIS pp. 1-2 and 1-4.)

The consulting firm that worked for BLM in preparing this EIS was under contract for the work to PNM as provided for in the CEQ Regulations. This relationship is described in the Preparers section of this FEIS.

Proposed Action
Comment. Why is the railroad track on the opposite side of the plant from the coal-handling facilities, thereby preventing the use of trains for delivery of coal and creating the need for trucks that would result in increased road maintenance? (60.)

Response. The proposed action and alternative fuel supply systems are both based on using San Juan Basin coal sources within an approximate radius of 30 miles. This distance does not allow delivery of coal by train at a cost that is competitive with trucks. Therefore, the siting of rail facilities in proximity to coal-handling facilities would not be advantageous. It should be noted that coal would be transported by conveyor belt from the boundary of the proposed plant site to the coal storage piles.

Comment. Why not use the same ROW for both proposed water pipelines and lay them at the same time in order to preserve initial reclamation efforts?

Was transporting the water by the irrigation canal to Highway 371 and then by

pipeline to the site considered in order to avoid disturbance over several miles of land between the San Juan River and Highway 371? (60.)

Response. The proposed action for the water supply system already includes the provision that both pipelines would be installed in the same ROW. The lines would be constructed at two different times because the second water pipeline would not be needed until the third and forth generating units are constructed.

Transportation of water by the NIIP canal system was considered but eliminated from further analysis because of: (1) legal constraints as detailed in the DOI Solicitor's Opinion dated April 23, 1982; and, (2) insufficient capacity in the canal system during months when irrigation demands are high.

Comment. Revise Tables 1-8 and 3-9 in order to compare the two intake locations with respect to induced flood damage. (252.)

Response. See changes to FEIS p. 1-42, Table 1-8 in response to this comment.

Comment. How will coal ash be disposed of? (289.)

Response. Ash would be disposed of by layering it in previously mined portions of the coal source mines (refer to DEIS pp. 1-16 and B-4).

Comment. Transmission line ROW should be limited to 50-75 feet instead of 200 feet. (292.)

Response. The rights-of-way for 500 kV transmission lines would be 200 feet in order to allow the use of long-span construction and provide flexibility for structure alignment. However, the actual width of disturbance would be less. This width would ensure that midspan conductor blowout from high winds would not exceed the ROW. BLM ROW grants do not authorize exclusive use; therefore portions of the 200 feet would be available for other compatible uses, such as grazing.

Comment. 500 kV transmission lines may have direct effects on the health of human beings and livestock because of electromagnetic fields generated. This should be addressed in the EIS. (428, 431.)

Response. See changes on FEIS p. 3-54 in response to this comment.

Comment. "Other environmentally sensitive areas" on DEIS p. 1-20 should include examples of sensitive areas for wildlife species such as riparian vegetation, raptor nest sites, and unique habitat. (433.)

Response. See changes on FEIS p. 1-22 and 1-26 in response to this comment.

Comment. Page 1-13 of the DEIS. "PNM owns and has started production at the De-na-zin Mine, which is within 2 miles of the proposed NMGS." This statement is utterly irrelevant, since the De-na-zin mine has very limited reserves, and will be exhausted by the mid-1980s. (457.)

Response. The proposed action would be to supply the necessary coal from the joint venture of Sunbelt and Arch Minerals Company and not the De-na-zin mine alone (p. 1-13 of the DEIS and p. 2-13 of the Project Description TR). In the areas outlined for this joint venture (Map 2-1, Project Description TR), there would be sufficient coal to supply NMGS for its expected economic life (40 years per unit).

Comment. The DEIS, p. 1-13, describes a proposed "Bisti coal mine" action. No map is supplied. Would the proposed mine be on existing federal leases, on existing state leases, on existing PRLAs, on proposed new leasing tracts, or where? (457.)

Response. The Bisti Mine is a combination of existing leases and pending PRLAs. There is enough uncommitted coal under existing leases within 30 miles of NMGS to fuel the plant for the life of the project (40 years per unit).

A map and explanation for lands comprising the "Bisti mine" is provided in the Project Description TR, pp. 2-13 through 2-16.

Comment. On p. 1-15 of the DEIS, it is misleading to say the ponds will be lined with an impervious material. It would be more appropriate to state the lining will have a very low permeability and then state its approximate permeability and what the liner will be made of, i.e. synthetic liner, gunite, clay, or some other material. (478.)

Response. Please refer to p. 2-43 of the Project Description TR. "The ponds would be lined with impervious material to limit and control seep losses and would conform with applicable state and federal regulations." The material to be used and the approximate permeability cannot be detailed until the final design specifications are available.

Comment. If SJRRC leases are not included in baseline 1 or 2 it should be made more explicit in the baseline definition. If the SJRRC lease proposed actions are not included in baseline 1 or 2, then they are isolated in a separate document and are not included as part of a reasonable future environment for NMGS. (490.)

Response. The proposed action and impacts for the SJRRCL EIS were not included in baseline 1 or 2 because they are not approved and are the subject of the SJRRCL EIS. Because of this, these leases were considered in the cumulative impact assessment as was summarized in Chapter 3 of the DEIS and in the Draft Cumulative Overview. Also refer to DEIS p. CI-1.

Comment. Several comments questioned the DEIS dates for transmission and water pipelines, stating that they are false because PNM is not planning these project components in the years specified in the DEIS. (273, 457.)

Response. The DEIS states on p. 1-1 that PNM projects a need for electricity in the 1990s and that the first unit could be needed as early as 1990. Also stated on DEIS p. 1-4, units 1,2,3, and 4 could be available in 1990, 1993, 1995, and 1998 respectively.

Based on the revised need statement, the four units could be needed in 1993, 1997, 1999, and 2002 respectively; however, the planning time frame for NMGS has remained the same (1990-2000) and the possible differences in impacts resulting from a change in dates (Delay of Action Alternative) has been analyzed for Social and Economic Conditions.

Comment. The DEIS and supporting technical documents do not discuss the design of the water-using components in the power plant. Water quantity and quality needs are a function of the design of cooling, piping, evaporation, treatment, and storage systems. The need for 35,000 ac-ft/yr is not supported by any calculations, and quality needs are not discussed. (484, 497.)

Response. A conceptual water flow diagram showing major water sources and water uses in gpm per unit is shown on Figure 2-3, p. 2-37, of the Project Description TR. This diagram would be generally applicable for any combination of feasible water supply and treatment options available. Water use and total water requirements indicated by this diagram would not change substantially regardless of the design of piping, treatment, or storage systems because the major consumptive use of water in the plant would be within the heat rejection system.

The proposed action (and design) for the heat rejection system has been specified as 100 percent use of wet-cooling towers. Based on this proposed action the 35,000 acre-feet per year is an accurate estimation of total water requirements for the four proposed units.

Water quality of San Juan River water and wellfield water (Tables 3-1, 3-2; Project Description TR) have been considered in the overall water management system.

Comment. Dry-cooling should be considered as a reasonable alternative and should not be dismissed solely on the basis of capital cost and land use constraints. Also, there could be operating savings cost if PNM is forced to replace water used by existing San Juan Basin water users.

Finally, an air-cooled commercial coal-burning power plant already exists in one arid state (the Wyodak 1 plant in Wyoming), sug-

gesting that dry-cooling cannot simply be rejected out of hand. (457, 519.)

Response. Dry-cooling was not considered a reasonable alternative because of technological, environmental, and economic considerations (p. 2-59 of the Project Description TR). Dry-cooling towers, and turbine designs to generate them, have been developed but have not been used in any power plant whose generating capacity exceeds 330 MW. Installed costs could be substantially higher (20 times) than for mechanical draft wet-cooling systems.

Comment. How are sewage effluents to be disposed of? (474.)

Response. The sanitary sewage treatment system is detailed on pp. 2-53 and 2-54 of the Project Description TR. During the construction period, portable chemical toilets would provide sanitary facilities. During operation of the NMGS, two sanitary treatment plants would be constructed, each with a capacity of 30,000 gallons. The effluent from sewage treatment would be delivered to the water management system for reuse within the generating complex.

Comment. Do the proposed transmission lines parallel existing lines to Albuquerque? If not, why? Visual impacts would be less noticeable. (60.)

Response. The percentage of proposed transmission line ROW that parallels existing utilities or roads was shown in Table 1-4, p. 1-22 of the DEIS. Further detail is provided in the Project Description TR, pp. 4-5 through 4-7. Briefly, the proposed lines parallel existing utilities or roads the following percentages of their length: T2 = 91; T1 = 32; T3 = 36; T4 = 70.

Comment. Coal would be hauled to Sunbelt Mining property directly north of NMGS and adjacent to the NMGS boundary. The two sections directly north of the NMGS site do not belong to Sunbelt. (457.)

Response. At the time of the initial draft of the EIS, the property did belong to Sunbelt. This property now belongs to another company. See changes on FEIS p. 1-14 in response to this comment.

Comment. On DEIS p. 1-20, "The applicant estimates that a 14-year period (1985-1998) would be required for site preparation and construction of NMGS Units 1 and 4." This is false. PNM Vice President Ackerman has stated that even for a 1995 unit, construction would not have to start until 1991. Since Unit 4 is now planned for 1999, PNM is planning a construction period of 9 years, not 14. (457.)

Response. The 1985-1998 site preparation and construction time frame was based on the assumption that Unit 1 would be operational in 1990. If the revised schedule of in-service dates for Units 1, 2, 3, and 4 is 1993, 1997, 1999, and 2002, then the site preparation and construction period would be approximately 1988 to 2002, which is still 14 years.

Comment. Alternative coal sources are not analyzed in sufficient detail. (484.)

Response. As was indicated on DEIS p. 1-13, the alternative of the use of other than the pro- posed San Juan Basin coal was analyzed in parallel with the proposed coal sources. The only difference in this alternative, from the point of view of environmental analysis, is the use of NM 371 for an additional 18,000 miles per day, in the worst case. Use of this highway for this purpose would require authorization of the NM Highway Department. Adverse impacts associated with the alternative which exceed those for the proposed action would be for maintenance of Highway 371, traffic safety, and, in some cases, of the experience of solitude currently available in the Bisti WSA.

Another coal source alternative that was identified but not brought forward for more detailed analysis was use of coal from outside the San Juan Basin. DEIS p. A-5 says this alternative would be significantly more costly due to mining and transportation costs.

Comment. DEIS p. S-1 states "Fuel for the plant would be obtained from surface mines currently under lease." This statement contradicts SJRRCL DEIS, where NMGS is cited as a possible user of coal from either leases to be sold in late 1983 or PRLAs to be issued in 1983. Neither constitutes a current lease. If the NMGS DEIS is correct, then there is no

basis for leasing the proposed Bisti #1, #2, #4, #6 and #8 tracts and the lease sale should be reduced. (457.)

Response. No specific reference to NMGS as a potential coal source could be found in the SJRRCL DEIS. The proposed coal source for NMGS includes existing leases and some pending PRLAs. There is, however, enough coal under existing leases to fuel the plant for its life (40 years per unit.)

Comment. DEIS Table C-4, pp. C-5 and C-6, lists 13 coal mines included in the baseline analysis. The list and data given contradict the Regional Coal DEIS. In that DEIS, production from existing mines and leases is given as under 30 million tons/year in 1995, the year of the initial NMGS operation. But the mines listed in Table C-4 for 1995 operation have planned production in that year of well over 30 million tons. On the other hand, the BLM has omitted the Gateway mine, already operating in T24N, R13W, less than 5 miles from the NMGS site. (457.)

Response. The estimates of coal production were made from the best available data from coal company estimates and other sources, e.g., OTA, State of New Mexico. Estimates reflect market conditions and estimates of the future. Variations in terms of impact analysis results are not considered to be significant. The estimates of mines and production levels for consideration as baseline were used consistently throughout the NMGS EIS analysis. Some of the bases may have changed (including operation status of the Gateway mine) over the time period of developing the EIS, but relative levels of impacts would be the same and the estimates would be conservative.

Comment. The wildlife, vegetation, and cultural resources present at the reservoir site should be described. (505.)

Response. Wildlife and vegetation at the proposed and alternative reservoir sites are similar to resources discussed for the NMGS site and are therefore not repeated, as per the CEQ regulations. Additional detail is provided in the Vegetation TR, pp. 3-26, 4-8, 4-14, and the Wildlife TR, pp. 4-21, 4-22, for these resources.

Cultural resources are not described because no surveys have been conducted at the reservoir location. However, it is an applicant-committed practice (DEIS p. 1-29) that the reservoir site would receive a 100 percent Class III inventory before ground disturbance could proceed.

Comment. Will power be made available from the proposed 500-kV lines to local residences? (194.)

Response. PNM cannot provide for local electrical distribution because this area is not in PNM's service territory. The affected areas are served by the Navajo Tribal Utility Authority and the Jemez Electric Cooperative. Any distribution of local power would have to be negotiated with the Navajo Tribal Utility Authority and the Jemez Electric Cooperative.

Comment. T1 crosses the Nageezi Tract (an identified federal coal leasing tract) between milepost 10 and 15.5. This should be mentioned in the EIS. T1 also crosses portions of three State of New Mexico coal leases held by the Salt River Project between mileposts 10 and 15.5. This should be mentioned in the EIS. (415.)

Response. The assessment of impacts to mineral resources was designed to focus on identifying conflicts with mineral extraction in the future and therefore did not include such administrative aspects as the lease name or leasee. On DEIS p. 2-39 it states that T1 crosses approximately 12.5 miles of coal field. This includes the Nageezi tract and the three state leases.

Comment. Only sites capable of sustaining 2000 MW are discussed. (457.)

Response. PNM has applied to BLM for ROWs supportive of a generating station which would be of 2000 MW capacity and maximum development. Use of the environment at maximum development was determined to provide decision-makers and the public a worst-case analysis of environmental effects. Should the size of the proposed station change, additional environmental analysis may be needed for many of the state permits which would be required.

Additional analysis for complying with NEPA may also need to be done based on potential environmental impacts of specific final locations, size, and designs of various project components.

Comment. A coal-fired power plant will create "mountains of coal waste." When coal is burned, almost ten percent ends up as ash. Have you considered this factor? (331.)

Response. The estimated average production of coal-derived wastes from the proposed NMGS (including bottom and fly ash) would be about 1475 ac-ft/yr, or 59,000 ac-ft/yr over a 40-year period (p. 46, DEIS). These wastes would be disposed of in previously mined coal mines near the proposed NMGS (p. B-4, DEIS).

Comment. The discussion of pipelines in the DEIS does not address evaporation from the storage reservoir. These losses could be over 1000 ac-ft/yr for a 200-acre pond.

Alternative reservoir and plant designs should be discussed as mitigation measures for water conservation. No environmental analysis of the wet-dry cooling tower alternative is included in the DEIS. (133[a], 457, 484.)

Response. The evaporative losses from the proposed reservoir are shown on Figure 2-3 (p. 2-37) of the Project Description TR. They are estimated to be 220 gallons per minute.

Several heat rejection systems were identified in the DEIS (p. 1-9) as alternatives rather than mitigation as suggested in the comment. Two of these alternatives were selected for further analysis based on consideration of environmental, social, and economic factors. The remainder of the alternatives were not selected for further analysis for reasons given in Appendix A (DEIS p. A-5). Although consumptive use of water was one of the factors considered in this process, the overall selection and analysis process for reasonable alternatives must consider all environmental, social and economic factors involved and not be limited to just one (such as water consumption).

Environmental analysis for the wet-dry cooling tower alternative is included in all references to alternative 2 for water supply, i.e., 20,000 ac-ft/yr from the San Juan River in combination with a wet-dry cooling system (p. 3-5, Project Description TR, and p. 1-17 of the DEIS). In these discussions it is emphasized that the primary environmental considerations for the wet-dry cooling towers are:

- More land area required for wet-dry (DEIS p. 1-16)
- More hardware and cost associated with wet-dry (DEIS p. 1-16)
- Less water consumption by wet-dry (DEIS p. 3-7, Project Description TR)

Environmental impacts associated with wet-dry cooling towers would therefore be related to more land area being required and less water being required than for wet type cooling towers. Additional land requirements were not considered significant because the entire plant site within which the towers would be located was already assumed to be disturbed. Detailed analysis for consumptive use of water was not conducted because potential worst-case impacts were already considered within the analysis for the proposed action. DEIS pp. 1-37 and 1-38 provide a summary of important impacts for the water supply alternative that would make use of 20,000 ac-ft/yr of water in combination with a wet-dry cooling system.

Comment. Fly ash uses are not discussed. PNM plans to recover aluminum from the fly ash. (457.)

Response. PNM's proposed action for fly ash disposal is described on DEIS pp. B-4 and 5. The proposed action is to segregate the fly ash and store it in such a manner to recover it if future economic conditions warrant.

Comment. PNM currently plans only one transmission line instead of two. Additionally, one comment stated that the transmission lines analysis was not conducted in sufficient detail. (273, 457, 484.)

Response. PNM has applied to the BLM for three 500 kV transmission lines (Application No. NM 30841, DEIS p. 1). These three would be supportive of maximum development of NMGS at 2000 MW. Descriptions of these proposed lines are on DEIS pp. 1-20 to 1-27.

As stated in the DEIS (pp. 2 and 3), this analysis is intended to supply information from which a selection of corridors can be made. Once a corridor is selected, centerline surveys would be conducted to identify the exact alignment. Route-specific stipulations would be developed at that time. Site-specific supplemental environmental analyses would be done where necessary.

The NMGS EIS evaluated the environmental consequences of the NMGS proposal at the maximum possible development for 2000 MW. At this proposed (and environmentally worst-case) development alternative, the three 500-kV transmission lines would be needed and were therefore analyzed by the BLM to avoid understating project-related impacts at maximum development.

Alternatives to the Project

Comment. With regard to potential out-of-state power generation projects listed in the EIS:

1. The Southwest Project and the Colorado-Ute Project are the same.
2. The Sunflower Electric Cooperative (in Kansas) is omitted, which has offered to sell 100 MW to PNM in 1988-98.

(457.)

Response.

1. This is correct.
2. The list of projects on page A-32 of the Alternatives to the Project TR was not intended to be comprehensive; rather it provides examples of the types of out-of-state power generation projects being considered for the 1990s.

Comment. Many changes in the alternatives analysis are needed since, by using inaccurate sizes and dates for PNM's share of NMGS, the BLM has incorrectly excluded alternatives. The BLM considered NMGS as a 2000-MW project coming on line in 1990-98, when it is actually a 600-MW project planned for 1995-99. (17, 133[a], 250, 420, 457, 478, 484.)

Response. The alternatives analysis assumes that the electrical power need projected by PNM would have to be met. The reasonableness of PNM's need projections is addressed in the DEIS, in the Purpose and Need TR, and in the previous Revised Information section where additional analysis of alternatives is presented, based on the revised load forecast.

To identify the effects of this possible reduction in size and delay of schedule for NMGS, a review of the process for selecting alternatives was performed.

Comment. Since NMGS is not planned for construction start-up until 1991, a choice between direct-fired coal and coal-gas combined cycle could be made as late as 1990 and still allow 2 years for pre-construction design work. By 1990, Coolwater will have 6 years' operating experience. If it works as planned, it will have proven BLM incorrect, and a direct-fired power plant need not be built. (457.)

Response. The proposed construction date for NMGS is 1986, not 1991. Consequently, the alternative of coal conversion plus generation (discussed on pp. A-4 and A-5 of the Alternatives to the Project TR) may not be commercially available. The alternatives analysis assumed the NMGS would be needed as proposed.

A possible delay in the construction date could change PNM's proposal. If that delay were to occur, PNM would have to demonstrate that its proposed technology was the most economically reasonable to the New Mexico rate payer (given technical reliability and other considerations).

Comment. The true no-action alternative -- doing nothing -- is not considered. (17, 24, 133, 133[a], 204, 435, 457, 458, 484, 497.)

Response. The alternatives analysis assumes that the electrical power need projected by PNM must be met. In this case, doing nothing is not a likely consequence of the BLM rejecting PNM's application since PNM would have to meet the need by some other means. (The reasonableness of

PNM's need projections is addressed in the DEIS, in the Purpose and Need TR, and in responses to comments on purpose and need.)

PNM has stated (in its letter to BLM of May 27, 1983, Appendix E) that "if the forecast is below the low range of the envelope (of load forecasts identified in the DEIS), PNM would not request NMPSC approval (to construct NMGS)." The DEIS also stated on p. 3-49 that if NMGS were not constructed and operated, the impacts associated with it would not occur.

Comment. Little space is devoted to nuclear power as an alternative in the NMGS DEIS and this alternative is not accurately evaluated. If there are reasons not to use coal to generate electricity at the NMGS perhaps nuclear power is the answer. This possibility needs to be addressed in more detail. (169, 438.)

Response. Several nuclear power generation alternatives are discussed in the Alternatives to the Project TR on pp. 2-7, 2-8, 3-7, 4-5 through 4-6, and A-27 through A-31. The level of analysis provided in the TR and summarized on p. 3-50 of the DEIS provides a benchmark against which the consequences of the proposed action can be evaluated during the decision-making process.

Comment. Coal gasification and nuclear options are dismissed because they would not be available until the mid-1990s. (457.)

Response. These alternatives are considered. See Table 1-6 in the FEIS and Table 2-2 (p. 2-7) in the Alternatives to the Project TR.

Comment. The analysis of alternative energy systems is very poor in the EIS. One sentence is devoted to conservation. Several alternatives are ignored such as solar home-heating, cogeneration, and small hydroelectric at existing dams. The analyses are brief and vague, and they contain no information specifically on New Mexico. There is not sufficient detail to compare alternatives with the proposed action. (90, 204, 457, 497.)

Response. The Alternatives to the Project TR contains the analysis of each of these and many other energy options and alternatives, utilizing New Mexico-specific data where it was available. See especially pp. A-33 to 34 where consideration of conservation is summarized. See pp. A-17 and A-18 for a discussion of point-of-use solar heating. See pp. A-10 and A-11 for information on hydroelectric and see pp. A-36 to A-38 for a discussion on cogeneration.

Comment. None of the alternatives are discussed in sufficient detail. In particular, the following alternatives are not discussed in sufficient detail: renewable resources, conservation, hydroelectricity, wind, and solar. (133[a], 169, 250, 258, 435, 437, 451, 457, 458, 478, 484.)

Response. Further details on alternatives to the proposed project, including these specifically cited, are included in the Alternatives to the Project TR.

Comment. Coal gasification is a potentially viable alternative. (457.)

Response. This is considered as a potentially viable alternative and was discussed on p. A-4 of the DEIS and in the Alternatives to the Project TR on pp. 4-2 through 4-4 and A-4 through A-5.

A demonstration plant for coal gasification is currently under construction at Southern California Edison's Coolwater Plant (Electrical World, March 1983). This type of plant could require less pollution control equipment than a conventional coal-fired power plant. Changes are provided in the Changes to the Text section for DEIS pp. 3-49 and A-4 in response to this comment.

Comment. It is incorrect that the environmental effects of an out-of-state power source would be similar to those in New Mexico, as stated in the EIS. (457, 478, 496.)

Response. See changes on FEIS p. 3-59 in response to this comment.

Comment. The footnotes to Table A-1 of the DEIS list a 1980 PNM report which does not exist as a source. (457.)

Response. See changes on FEIS p. A-2, Table A-1, in response to this comment.

Comment. Atmosphere fluidized bed combustion technology is omitted from the list of alternatives; however, PNM itself says that this method of burning coal is expected to be commercially available by 1992. (457.)

Response. Atmospheric fluidized bed combustion (AFBC) was felt to be too similar to conventional generation to be considered as a separate energy alternative. It was not considered in detail as a project component alternative because the technology is still under development and is technically unproven. PNM gives the following discussion of AFBC (Description of the Proposed Project: New Mexico Generating Station, revision 1, 1981):

> In AFBC, a fluidized bed is produced by turbulent flotation of crushed inert particles in a rising air stream. Fuel is injected into the bed at a rate which allows it to be completely burned with the fluidizing air. A material capable of absorbing SO_2, such as limestone, is injected into the bed to permit combustion of relatively high sulfur fuels without FGD. Boiler tubes are immersed in the bed and further tubes are exposed to hot exhaust gases to raise steam to generate electricity.
>
> With controlled combustion operating at furnace pressures near atmospheric and relatively low temperature (1500 to 1600°F), AFBC promises an economically and environmentally acceptable way of burning coal; sulfur is captured in the sulfur-absorbing material and NO_x formation is low due to low furnace temperatures. Although AFBC is expected to be competitive with conventional coal-fired base load units, commercial availability with operating experience is not expected until the late 1980s to early 1990s.

Comment. High temperature gas reactors (HTGRs) are rejected in the EIS based on their unavailability in the required timeframe. However, the DOE is currently spending several hundred thousand dollars to study a possible New Mexico site for a 300 MW HTGR to be built in the mid-1990s. (457.)

Response. As shown on Table 3-3 in the Alternatives TR, to be retained, an alternative must be available to come on line by the end of PNM's planning period for NMGS (1998). For an HTGR plant to be available by this time a decision would have to be made by 1988 or earlier. No operating demonstration HTGR plant will be on-line by that time, so the technology will not be available for commercial operation by 1998.

Comment. The EIS contains no discussion of bulk power markets. This omission precludes consideration of how generation and transmission resources might best be developed in a manner consonant with the conservation of resources and least burdening to electric consumers. (478.)

Response. The scope of the DEIS is limited to a consideration of environmental effects of the proposed project and alternatives to it.

Comment. Why is there not an alternative mentioned for having one corridor for all transmission lines? What impacts would be mitigated or worsened by this arrangement? (457, 496.)

Response. From the perspective of system reliability, the concentration of two major transmission lines in one corridor is not desirable, particularly if the corridor is already occupied by one or more additional lines, e.g., T_4 and T_2. This would make a major portion of the energy supply for the region vulnerable to a single natural or man-caused disaster.

Comment. The feasibility of the use of uranium mine dewatering discharge should be determined. (444.)

Response. The reasons for elimination of this potential water source are summarized

on DEIS p. A-5 and further discussed in the Hydrology TR.

Comment. The DEIS completely ignores cogeneration, although the utility presently operates cogeneration in their service area. (133[a], 458.)

Response. This alternative is discussed in the Alternatives to the Project TR. It was not retained for further analysis in the DEIS because it does not appear to meet a screening criterion of providing or eliminating the need for at least 5 percent of the proposed annual output of NMGS.

Comment. The alternatives are inconsistent in that they are not addressed equally. For example, in Technical Report 3 of 22, a discussion of a wind generation alternative talked about noise. The selected alternative (SA) would certainly create as much or more noise and dust in the trucking of coal, as the SA facility would require 7.5 million tons a year. (498.)

Response. The relative magnitude of impacts such as noise cannot be quantified because it would be dependent on site-specific conditions; location for the wind generation is undetermined. This is also true for other impacts which would be dependent on location.

Comment. Page 3-39 of the DEIS gives a ratio of .305 for energy output/energy used. What are the comparison figures for the other alternatives? These should be disclosed. (496).

Response. Most of the alternatives to the proposed action that were analyzed in detail would have a negligible effect on the energy use of NMGS. See the Alternatives to the Project TR, pp. 4-11 to 4-15.

Comment. Regarding the decentralized coal alternative, what are the potential sites? (496.)

Response. As described in the Alternatives to the Project TR (pp. 4-1 to 4-2), site-specific analyses were not conducted. Estimates of environmental effects (impact type and magnitude) could be made without site-specific analyses.

Comment. What is the feasibility of meeting electrical demand through the near to medium-term future by way of conservation plus wind energy plus biomass. (496.)

Response. The potential contribution of these alternative sources are discussed in the Alternatives to the Project TR (pp. A-20 to A-34). Their contribution to meeting the 2000-MW (or even 600-MW) baseload demand proposed for this project is low.

Site Alternatives

Comment. Page 3-40. "The Torrance site is located in the Estancia Basin in Torrance County...." "Manzano Peak, is about 7 miles northwest of the site."

The BLM provides no map, although NEPA requires alternatives to be treated substantially. Based on the statement about Manzano Peak, however, the BLM appears not to be describing the Torrance County site which PNM itself has ranked most favorably. PNM's preferred Torrance County site, known to PNM as Torrance 1B, is east of Willard, New Mexico, and more than 20 miles from Manzano Peak.

The alternative site described in Torrance County appears to be different from the Torrance County site which PNM found most attractive in its most recent analysis (1978) of sites in that county. (133, 457.)

Response. Please refer to p. 2-60 the New Mexico Generating Station Site Selection Report (WCC 1980). Also, the siting studies were done based on candidate site areas which were large blocks of land within which particular points were chosen for analysis. The Torrance site described in the DEIS falls within the Torrance County candidate site area.

Comment. The initial criteria for the selection of the site for the power plant have changed and thus not only have time lines been altered, but the main justification for the originally selected site now stands nullified. (164.)

Response. The primary criteria for the site selection process were economic, environmental, and technical considerations which have not changed substantially. The timing

of the plant was not a consideration in the site-selection process.

Comment. The EIS is biased towards building the plant. It insists that, if NMGS is not built by 1990, other sources of power would have to be built. It says Bisti is the only reasonable site. These conclusions are based on analysis of need in siting that BLM has spent no effort in reviewing, and that are the findings of WCC, a company that works for PNM, the firm proposing to construct NMGS. (17, 491.)

Response. Neither does the BLM or the DEIS insist that if NMGS is not built by 1990, other sources of power would have to be built. The BLM addresses possible consequences of the No Action Alternative as per the CEQ regulations. The DEIS is explicitly clear with respect to the issue of purpose and need for the proposed facility, that the ultimate responsibility for determining need rests with the NM Public Service Commission.

The DEIS is also explicitly clear with respect to the issue of alternative sites. The BLM, acting as the federal lead agency for the preparation of the EIS, has undertaken complete responsibility for the preparation of the EIS and has expended considerable effort in the review and preparation of this document. The environmental consulting firm, working as an EIS third-party contractor, is working directly for the BLM and in accordance with the regulations of the Council of Environmental Quality in regard to third-party environmental contractors.

Comment. Site-selection process was not objective and Bisti was chosen without consideration of other sites. (132, 396, 491.)

Response. The state of New Mexico and three counties of west Texas were screened to identify candidate areas for the siting of a 2500-MW coal-steam generating station. The screening considered environmental, technical, and economic information. From this screening, 22 candidate areas were identified. The NMGS site near Bisti was not among these areas because it had initially been screened as being too far from a water source and for potentially conflicting with oil and gas development. However, these criteria were changed for the second phase of the site-selection process, and based on the revised criteria Bisti ranked first overall. PNM then pursued acquiring the Bisti site.

Comment. Site-selection considerations and alternatives were explained, but an overwhelming bias towards project economics versus environmental protection is evident. A more thorough consideration of site alternatives and project segmentation (possible multiple sites with small appliances) with associated costs should be represented. (266.)

Response. Site alternatives and alternatives to the project were addressed by the BLM. Site alternatives are discussed in the Site Alternatives TR and two other associated documents: "Summary of Site Alternative Evaluations for the New Mexico Generating Station" and "New Mexico Generating Station Site Selection Report."

Alternatives to the project are discussed in the Alternatives to the Project TR. Possible multiple sites with small applicances (Decentralized Coal) are discussed in Section 4 and in particular Section 4.1 of this TR.

Comment. Page 3-44. "McKinley Site." Again, the BLM does not provide a map although the proposed action gets 65 maps. The total description of the McKinley site is less than two pages, hardly the "rigorous" consideration of alternatives the law requires. (396, 457, 491.)

Response. Please refer to the New Mexico Generating Station Site Selection Report, Volumes 1, 2, and 3, which are incorporated by reference in this EIS. Documentation including maps are extensively presented. The McKinley site area, as well as the Torrance site area, are described in considerable detail in these volumes.

The reader should begin with Volume 1 to gain an understanding and the context in which the site-selection studies evolved. BLM has reviewed them and has satisfied itself that it would be reasonable to proceed with a detailed environmental analysis of

only the proposed Bisti site for the NMGS EIS.

Comment. DEIS p. S-6. For an alternative site, "sites potentially capable of supporting a 2000-MW coal-fired electric station may have to be considered."

This is false. Only a 600-MW alternative is required to completely replace PNM's proposed share of NMGS. (457.)

Response. Tables S-2 on p. S-6 was a presentation of the various no-action alternatives to the proposed action. To the extent that PNM's proposed action is consideration of a 2000-MW coal-fired steam electric generating station in San Juan County, Tables S-2 merely identified, in the systematic manner, all the no-action alternatives. Sites, other than Bisti, capable of supporting a 2000-MW station were included in the presentation.

Comment. The description of the Torrance site on p. 3-40 of the DEIS is a criticism of the site by PNM's consultant WCC, and does not directly address PNM's preferred Torrance County site, referred to in Comment 457. As such, the statement referring to higher terrain in the west causing poor dispersion potential is questioned. (457.)

Response. It should be noted that the BLM independent review was concerned with specific site alternatives that were addressed in Interim Ranking 3 and should not be confused with site alternatives discussed in Interim Ranking 1.

Comment. Pages 3-40 to 3-46. The DEIS discusses Torrance and McKinley sites.

Alternatives: The BLM omits any discussion of transmission lines although this is technically a DEIS for rights-of-way decisions. No mention is made of the fact that Torrance and McKinley are both closer to Albuquerque than Bisti, meaning less land impacted, and fewer transmission losses of power and energy. Nor does the BLM discuss proximity to pumped storage plants, a potential use of NMGS output which PNM's analysis considered. (457, 483.)

Response. The site-selection process as discussed in the NMGS Site Selection Report (Volume 1, Section 3.3.2, pp. 3-8 through 3-11 and Section 3.3.3, pp. 3-11 through 3-16, and Volume 3, Appendix F.1, pp. F-1 through F-15) utilized weighting and trade-offs that include transmission line costs and impact. Transmission line losses are included within the cost category. Therefore, the lower transmission line losses associated with the alternative sites are included in the overall cost of each site. Additionally, the environmental criteria used in the ranking, which include land use impacts, are reflected in the ranking for the transmission systems associated with each site.

NMGS would not be constructed strictly to supply energy to a pumped storage facility. Energy for a pumped storage facility would come through interconnection with the PNM system and it would be difficult if not impossible to isolate the exact generating unit from which energy would be supplied.

Comment. Alternative sites are not discussed in sufficient detail and are not mapped. (258, 396, 457, 478, 484, 491.)

Response. DEIS pp. 3-40 to 3-46 summarized alternative sites considered. The 20-page Site Alternatives TR summarizes the multiple-volume site selection report that was prepared by Woodward-Clyde Consultants for the applicant. These reports provide detail of the site selection process and maps showing the locations of alternative sites. These reports are publically available and incorporated by reference into this EIS and are therefore not duplicated.

Comment. For a variety of reasons, the BLM's selection of the Bisti site is flawed. The DEIS itself provides a decision-maker virtually no basis for deciding among the sites. It has no maps of the alternative sites. It gives contradictory descriptions of where the McKinley site is located. It describes a Torrance site which is different from, and inferior to, PNM's preferred Torrance site. It manages never to mention that PNM, WCC, and the BLM have all found the

Torrance site environmentally superior to the Bisti site.

The Site Alternatives TR is not much better. It is only 21 pages long, with the first page explaining that it is mostly based "on a siting study that PNM prepared for its own use [in 1975-1977]" (Site Alternatives TR, p. 1-1), and the next 16 pages describing that 5-year study and its results. Only the last 4 pages of the Site Alternatives TR describe the BLM's review of the PNM and even then only in general terms. There is no way for the reader to replicate the BLM's site ranking (Site Alternatives TR, p. 3-3). Finally, despite the conclusion that the Torrance site would be environmentally preferable to Bisti (Site Alternatives TR, p. 2-16), and that Torrance would also be cheaper than Bisti if wet/dry cooling had to be used at Bisti (Site Alternatives TR, p. 3-3), the "BLM determined that it would be reasonable to proceed with a detailed environmental analysis of only the Bisti Site for the NMGS EIS" (Site Alternatives TR, p. 3-4). (258, 457, 483, 484, 491, 496.)

Response. Were the Bisti site to be rejected by the BLM (no-action alternative), PNM would need to propose a different site for consideration which may or may not be a site in Torrance or McKinley counties. The full NEPA process would be brought to bear again, should another site be proposed.

BLM's purpose for reviewing and incorporating PNM's site selection process into the EIS was to evaluate whether or not the full NEPA process was warranted for the Bisti site, in light of other sites reviewed by the applicant. The BLM's conclusion was that their NEPA process effort is warranted.

Comment. The Site Alternatives TR is seriously flawed. A cost-benefit analysis should consider an interdisciplinary approach to measure environmental values at alternative sites. Other major flaws include:

1. The report is extremely abbreviated and excludes most detailed information, such as the weights given by PNM and BLM to the attributes used to compare sites.

2. Some attributes involve questionable criteria (e.g., assuming that population growth rates of greater than 10 percent per annum are unmanageable). Some important attributes (e.g., archeological and paleontological impacts) were not addressed.

3. BLM did not mention PNM's final ranking of sites, but relied on an earlier ranking.

(478, 496.)

Response. The Site Alternatives TR is an abbreviated presentation of the documentation of BLM's review of the applicant's site-selection process as well as the voluminous documentation of PNM's description of its own site-selection process. This detailed documentation is identified in the beginning of the Site Alternatives TR and is available for public review. The significance of the results of PNM's interim ranking 1, 2, and 3 is described on pp. 3-28 to 3-31, 4-30 to 4-31, and 5-1 to 5-5, respectively (NMGS Site Selection Report, Volume 1). BLM made an independent evaluation of the above which is reported in the Site Alternative TR.

Comment. Page 2-10. "Ranking the candidate site areas" was done by means of "tradeoffs" among the various impacts, which were developed using preferences of the project team consisting of representatives of PNM augmented by professionals in various disciplines selected from among (PNM's) consultants.

Note that PNM and people working for it chose the rules for picking among the sites. The trade-off process involves implicitly assigning dollar values to environmental and social costs. Without a statement of the weights used for different impacts, neither the public nor the decision-maker can judge their reasonableness. The Site Alternatives TR never says what trade-off weights were used. (483.)

Response. Detailed description of the decision analysis methodology, including the trade-off process that was used to evaluate the alternative sites, is described in a three-volume document entitled "New

Mexico Generating Station Site Selection Report."

Volume 1 of this report presents a comprehensive summary of the site-selection process as well as the ranking studies that were conducted. A detailed description of the ranking methodology could be found on pp. 3-1 through 3-31 of Volume 1. In addition, additional details of the methodology are presented in Appendix E of this document. Appendix E is contained in Volume 2.

It should be noted that the decision analysis methodology was selected principally because of the methodology's capability and flexibility to allow different decision-makers, including the public, to judge the reasonableness of the relative weights of importance assigned in the trade-off process. While PNM conducted the basic study, the BLM had the opportunity to independently review the methodology and assign its own weights of importance in order to assess the relative ranking of alternative sites.

Comment. Page 2-1. PNM's site-selection process was geared to finding a site for "up to 2500 MW" to be "on-line sometime in the mid-1980s."

These criteria mean that sites that were suitable for smaller plants only (due, say, to land and water constraints) or later operation (due, say, to lack of developed coal mines in the mid-1980s) would have been ignored or down-rated. The BLM does not appear to have sorted out such overlooked or underrated sites. (483.)

Response. The size of a power plant that can be developed at any given location depends primarily on the quantity of water available: the larger the quantity of water available, the greater the opportunity for development of a larger-size plant. Conversely, the smaller the quantity of water available, the smaller will be the plant that can be developed. On the other hand, a location with a large quantity of water can always support a smaller size plant, whereas the converse cannot be true.

In reviewing the PNM Siting Study, the BLM has considered PNM's siting approach that bears directly on the issue addressed in the above comment. The PNM siting approach explicitly screened for desirable site locations that had little or no water, in addition to screening for locations that had plentiful water supply. Locations that had little or no water and had favorable environmental and other site characteristics suitable for power plant siting would certainly be candidates for development of smaller-size plants. These locations with little or no water were nominally referred to in the PNM studies as "Dry Sites."

By utilizing this screening approach, BLM has satisfied itself that the likelihood of overlooking desirable site locations for supporting the development of a smaller size plant is significantly diminished.

Comment. Page 2-7. "Wet sites have a significant cost savings over nonwet sites."

This statement demonstrates the absurdity of selecting Bisti as the preferred site (DEIS, p. 1-42) without knowing whether PNM would be able to obtain surface water from the San Juan River. PNM's prospective San Juan River water supplier, Utah International, has its water contract challenged in court by the Jicarilla Apache Tribe. PNM's ground-water appropriation request is pending before the state water engineer. It is still very possible that the Bisti site could require wet/dry cooling, in which case it would be economically inferior to a Torrance site using wet cooling (Site Alternatives TR, p. 3-3). (483.)

Response. The BLM determined that it was reasonable to proceed with a detailed environmental analysis of only the proposed Bisti site for the NMGS EIS, based on the review of PNM's site-selection process and BLM's independent ranking studies. The determination was based on many considerations, including cost and availability of water. The issues raised by the comment will continue to be the focus of a continuing permitting process should PNM determine to proceed with NMGS.

PNM's water supply from the San Juan River is pending before the New Mexico State Engineer. Water supply in other parts of New Mexico, e.g., Estancia Basin, could also be subject to legal challenge by other interested groups. The EIS has presented this information but has not attempted to speculate or predict the outcome of these legal uncertainties. However, based on hydrologic data, in an effort to compare the San Juan River and Basin with Estancia Basin, the San Juan River and Basin both have a greater feasibility of supporting wet cooling.

Comment. No data are given as to what the dollar terms mean (net present value? 1976 dollars? 1995 dollars?) or the valuation of environmental cost (how many dollars per ton of sulfur dioxide?). Note that the "Bisti Mine" alternative refers to supplying the Bisti site with water from uranium mines, which is not an option considered in the DEIS. Using San Juan River water as PNM now proposes, with its uphill water pumping costs, is not considered in Tables 2-2 and 2-3 Note that Torrance is second economically (Table 2-2, omitting the now-defunct "Bisti Mine W" option) and first environmentally (Table 2-3), while Bisti is first or third economically (depending on cooling system), but thirteenth environmentally. (483.)

Response. For a discussion of the meaning of equivalent cost, please refer to Section 3.3.1, "Ranking of Alternatives," p. 3-16, New Mexico Generating Station Site Selection Report (WCC 1980). It should be noted that these equivalent costs are relative dollars and that the year in which they are expressed will not change the results.

Uranium mine water was considered in the DEIS. Refer to p. 1-9, Table 1-2 of the DEIS. Uranium mine water was considered as a project component alternative but dismissed because of the lack of long-term reliability of mine water as a dependable source.

Tables 2-2 and 2-3 are those found on pp. 2-14 and 2-15 of the BLM Site Alternatives TR. They are results of Interim Ranking 1, the principal objective of which was to deliver the relative siting preference on a regional basis. The conclusion of Interim Ranking 1 suggested that site areas in McKinley and Torrance counties would be preferred (see p. 3-28 of NMGS Site Selection Report, Volume 1) over areas in other parts of New Mexico.

For purposes of the ranking studies, it was sufficient at that stage of the study to undertake analysis to evaluate the regional siting differences as a function of the cost penalties associated with the cooling technology.

Comment. Page 3-2. In the BLM's review of PNM's site studies, "levels of the noncost attributes for each site were the same as in the Phase Two (PNM) ranking except for Torrance (agricultural impacts)."

This sentence means the BLM used impact rankings which included transmission lines to El Paso but ignored PNM's Eastern Interconnection line. It means BLM used air quality impacts based on the Torrance 1A site evaluated by WCC rather than the Torrance 1B site preferred by PNM, which is more than twice as far from the Manzano Mountains. (483.)

Response. In the context of this paragraph, the term "level" refers to numerical range of non-cost attributes. While BLM used the same attributes and the same numerical range of non-cost attributes, i.e., for air quality impacts, the increment concentration considered was 0 to 60 micrograms per cubic meter, the BLM made its own numerical determination of the values in quantifying environmental impact and in quantifying the relative weight of importance between attributes.

It should be noted that the BLM independent review was concerned with specific site alternatives that were addressed in Interim Ranking 3 and should not be confused with site alternatives discussed in Interim Ranking 1.

Comment. Page 2-7. "Transmission line routes were evaluated from each candidate site area to Albuquerque load center, to the El Paso load center and to the existing transmission system."

The BLM has not redone the transmission line impact assessment to exclude El Paso. Nor has it redone the analysis to include changes to the existing system, such as PNM's proposed 345-kV transmission line to Roosevelt County. This line is proposed for operation by 1985 and would pass approximately 30 miles from PNM's preferred Torrance 1B site (see maps in Chisholm testimony, PNM filings in NMPSC Case 1794 and in the September 7, 1977, Anderson memo (PNM) on NMGS siting). The BLM has incorrectly assumed that all lines from the Torrance site would have to go 60-70 miles to Albuquerque, crossing the Manzano Mountains en route, and it has incorrectly assumed (in the Site Alternatives TR) that transmission lines to El Paso are part of the NMGS project. (483.)

Response. The proposed action on p. 5-1 of the DEIS described two 500-kV transmission ties to the Four Corners-Ambrosia-Pajarito line plus two 500-kV transmission lines from the plant to a new substation near Albuquerque, New Mexico. Although the original site-selection studies (Volume 1, Section 3.3.2, pp. 3-8 through 3-11, Section 3.3.3, pp. 3-11 through 3-16, and Volume 3, Appendix F.1, pp. F-1 through F-15) included transmission systems to El Paso, they were not included in the proposed action. The proposed 345-kV transmission line is currently not interrelated to the NMGS system.

Comment. BLM has failed to analyze PNM transmission systems adequately in the site-selection process. (483.)

Response. Transmission systems were analyzed in the site-selection process, and comparisons were made between the sites based on miles of transmission corridor and the sensitivity of the areas to be crossed. These factors were then utilized in the overall ranking of sites.

Comment. Page 3-3. Table 3-1 shows the BLM's ranking of Torrance, McKinley, and Bisti with various cooling options. Torrance with wet cooling ranks above Bisti with wet/dry cooling but below Bisti with wet cooling.

Again, relative weights for different economic, environmental, and social factors are not given, so the numbers of Table 3-1 are useless to an individual decision-maker. SRIC has briefly reviewed the actual trade-offs used to convert environmental and socioeconomic impacts into dollars (WCC, "NMGS Site Selection Report," December 1980, Appendix E, p. E-51, Figure E-3 (attached)). This review shows that, buried deep in an appendix to an unpublished report backing up a TR to the DEIS, the BLM gave more than twice as much weight to cost as to all other impacts combined. Looking just at air quality (cost is shown in millions of dollars; impacts in micrograms of SO_2 per cubic centimeter), Figure E-3 shows that reducing air pollution to zero would be worth only $17 million. This valuation utterly flies in the face of reality; at the 1600-MW Four Corners 4-5 project, for example, the owners (including PNM) are currently spending over $300 million just to reduce sulfur emissions about two-thirds. Figure E-3 says that it would not be worth it to spend $17 million more even if that $17 million could completely eliminate sulfur emissions. In fact, since no other air pollutant is included in the BLM's trade-off analysis, SO_2 acts as a proxy for all air pollutants. So Figure E-3 says that it's not worth spending more than $17 million even to eliminate sulfur, nitrogen, and particulate emission together. The BLM may think $17 million is a fair trade-off for all the air pollutants from a 2000-MW coal plant, but Congress obviously did not when it passed the Clean Air Act. The BLM ignores the societal value of clean air by using the trade-offs in Figure E-3. (396, 483.)

Response. Details of the Ranking Studies are presented in the three-volume NMGS Site Selection Report.

It should be noted that the $17 million is a first-year, site-differential cost and is not comparable to the $300 million raised as an example in the above comment; $300 million is a capital cost. Furthermore, the $17 mil-

lion figure, as a first-year, site-differential cost, is a proxy for annual differential site cost (see pp. E-18 through E-20 of NMGS Site Selection Report). The $17 million is in 1974 dollars, while the $300 million is in 1981-1983 dollars.

The $17 million annual could be converted to a present worth if necessary for comparison. Escalating the $17 million to 1990 and expressing as a present worth, the annual cost ($17 million) is equivalent to a present worth of $791 million. Assumptions are:

Escalation from '74 through '81	-	GNP Implicit Deflator
Escalation from '81 through '90	-	6 percent
Escalation for study period of 40 years	-	6 percent
Cost of Capital	-	12 percent

The figure $17 million is only an example of a case studied in the ranking studies to evaluate the trade-off coefficients on the relative weight of importance. The $17 million figure, while it reflects a greater weight of importance to economics, is only one case.

BLM independently made judgments regarding their relative weight of importance. In the case of the same example cited in the above response, BLM selected $26 million, as the point of indifference, which is over 50 percent greater than PNM's value, in favor of environmental values.

On the whole, BLM assigned considerably greater weight to environmental values. The results consistently showed Bisti as the highest ranking site when cost and environmental values were considered together.

Comment. Site Alternatives TR, p. 2-13. "The Bisti site was preferred when assuming either wet or wet/dry cooling systems for all alternatives."

This sentence is misleading. The Torrance site with wet cooling was ranked higher than the Bisti with wet/dry cooling (Site Alternatives TR, p. 2-14). Since Torrance and Bisti are in completely different ground-water basins, it is quite possible that wet cooling could be feasible at Torrance but not at Bisti. (483.)

Response. Information available in 1977 and available today, regarding the potential sources and quantity of water supply for power plant cooling, has repeatedly indicated that the feasibility of supporting an all wet cooling system has greater potential at Bisti than at the Torrance site area.

A power plant development in the Bisti area has the potential option of using both surface water (San Juan River) and ground water (San Juan Underground Water Basin), whereas in the Torrance area, there are only ground-water supplies (Estancia Basin). In comparing the feasibility of water supply development for power plant cooling at these two locations, it is obvious that an all wet cooling system, based on water resource extractions, would be feasible only in the Bisti area. The power plant could potentially have a dependable and reliable supply of water from the San Juan River. Additional detailed description of the nature and characteristics of the water supply of potential sources at Bisti can be found in Sections 2 and 3 of the Hydrology TR. Information regarding the ground-water supply in the Estancia Basin is described in Appendix A of the NMGS Site Selection Report (WCC 1980, and more specifically on p. 3-43 of the DEIS).

In summary, when considering the potential availability of water supply at either the Torrance site area or the Bisti site area, the Bisti site was judged to be better than Torrance.

Comment. The discussion of alternative sites is based on a Woodward-Clyde reanalysis of a siting study it did in 1974-1977 for PNM and El Paso Electric (Woodward-Clyde 1976). In this reanalysis, Woodward-Clyde found a site in Torrance County to be environmentally preferable to Bisti, but found Bisti to be preferable to Torrance County and McKinley County sites when "a combination of environmental factors and cost was considered." However, a review of this siting study done for SRIC (Marcus 1983) shows that the cost figures were based on outdated assumptions for transmission line needs, were based on

the use of Bisti coal, and undervalued air quality considerations. Thus, BLM should not use this Technical Report on Siting as an excuse for slighting the analysis of the alternative sites in the DEIS. (483, 484.)

Response. The costs utilized for PNM site-selection studies were in terms of differential dollars. Whereas the absolute values of the cost figures may be outdated, the differential costs are still valid in terms of judging the relative rank order of the site alternatives. Updating the cost figures would not materially change the order of site rankings as shown by BLM's independent evaluation in 1981 where cost figures were updated. Note also that no consideration was given to the cost savings at Torrance due to lower transmission losses there than at sites farther from Albuquerque.

Comment. Since fuel transport is one of the two major causes of differential site costs (Site Alternatives TR, pp. 2-6), ignoring non-Sunbelt coal sources is a major error in the Site TR Alternatives. (483.)

Response. See the New Mexico Generating Station Site Selection Technical Report for discussion of other sources of coal and their effects on coal costs. The further a site is from the coal source (San Juan County), the more expensive it is to transport. For this reason, Western Coal Company's Bisti mine (now related to Sunbelt) was assumed as the source of the cheapest coal--it is the closest to the NMGS site.

Possible End Uses of the Ute Mountain Land Exchange

Comment. Johnnie George expressed the concern about where he would live if the Ute Mountain Land Exchange involves T23N, R13W, Section 13, SE 1/4, and requested that PNM do a survey of an Indian allotment which he is heir to. (293.)

Response. The lands Mr. George refers to were included in the original 30,000 acres of land which were considered for exchange in the Environmental Assessment for the Ute Mountain Land Exchange. However, this land (T23N, R13W, Section 13, SE 1/4) is not among the approximately 8000 acres still being considered for exchange.

Comment. The DEIS does not adequately address the relationship between the Ute Mountain Land Exchange and the NMGS. It fails to clearly explain the fact that should the Ute Mountain Land Exchange be consummated there would be no need for an EIS, because the NMGS would then be located on private property, i.e., the reason for an EIS would be legally negated. (9, 478.)

Response. The relationship between the exchange and proposed NMGS project was explained on DEIS p. 1, i.e., the exchange is one method of PNM's acquiring the land for the proposed power plant. Other ways such as ROW grant, sale, or lease are also addressed. If the exchange went through, the lands would in fact become private; however, this does not negate the legal requirement for an EIS since the ROWs for transmission and pipelines are major federal actions requiring an EIS. In addition, agencies must address the possible end uses of an exchange, and the proposed power plant is an end use of the exchange and is therefore the subject to environmental analysis.

Comment. A substantial portion of the statement is devoted to the impacts of a new town to support the proposed power plant. This town is not part of the proposal nor has the need been established. When the need exists, a proposal would be made. A separate EIS should be written and evaluated on its own merit rather than as an unsubstantiated addendum to a larger statement. (254, 444, 458, 484.)

Response. The discussion of a possible New Town is presented because the town is a possible end use of the Ute Mountain Land Exchange. As stated on DEIS p. I-1, the possible New Town is not part of the NMGS proposal and that its development is not warranted at this time. Should a New Town become feasible, ROWs across federal lands would require that the New Town development be subject to the full NEPA process.

Comment. Inclusion of the possible New Town in NMGS appears premature and the analysis is insufficient to qualify as an EIS. The discussion is only useful to alert the governmental decision-makers of the fact that one possible use of the public lands in

the Ute Mountain Land Exchange is the creation of a New Town. A comprehensive EIS should be prepared if the exchange is approved. (113, 136, 355, 449, 484, 497.)

Response. The discussion of the possible New Town is intended to identify potential impacts of the New Town as a possible end use of the Ute Mountain Land Exchange, not to provide NEPA compliance for construction of a town. Impact analysis was conducted on available information concerning the development of a New Town. As stated on DEIS p. 3, development of a New Town is not feasible now. However, if it became feasible in the future, ROWs across federal lands would be needed and would require that New Town development be subject to the full NEPA process.

Comment. The New Town and associated coal mine are inextricably tied to NMGS and must be analyzed in the EIS. (496.)

Response. The possible New Town was analyzed on pages I-1 through III-5 of the DEIS. As was stated on DEIS p. 3, the coal source(s) are on existing leases or pending PRLAs and therefore impacts due to coal development have been or would be addressed on a site-specific basis in an environmental analysis that the Office of Surface Mining would prepare for individual mine plans.

Comment. It would be helpful to provide a discussion of the relationship between projected population growth and the need for the possible New Town. The existing analysis does not support the development of the possible New Town or BLM's recommendation to make public lands available for the town site. (532.)

Response. As was stated on DEIS p. 3, the feasibility of a New Town is under study by Paragon Resources, Inc.; however, at this time such a large and complex venture does not seem warranted. Should a New Town become feasible, needed ROWs across public lands for utilities would be subject to the full NEPA process. Also, as stated on DEIS p. I-1, no BLM decision on the proposed exchange has been made.

Comment. The relationships between the NMGS EIS proposals and those covered in the Ute Mountain Land Exchange EA are unclear. (136, 355, 449, 484, 497.)

In response to these comments and to enhance understanding of the relationship of the proposals, the tables summarizing the impacts discussed in the UMLE EA have been added to the text of this EIS together with a discussion of environmental consequences associated with a proposed wellfield and gathering system within and adjacent to the public lands subject to the UMLE. The Final UMLE EA has been added as Appendix J of this EIS.

These additions provide the basis for NEPA compliance for the sale, ROW issuance, lease or exchange for the NMGS site lands, transmission lines, and pipelines corridors for the proposed or possible end uses of NMGS; a new town; wellfield and gathering system; and/or continued grazing. Further, the Biological Assessment for these proposed and possible end uses has been submitted to the FWS and is included in this EIS (see Appendix H).

Comment. Who would be living in the possible New Town? Would the New Town only be for people other than Navajo people who are working at the mines and generating stations? (289).

Response. DEIS, p. I-1 stated that at the present time the need for a New Town in the area is not established. If a New Town were to be developed at this site in the future, a more detailed project description would be available with which to answer this question. As currently envisioned, the possible New Town may have the potential to house 8000 to 20,000 persons whose employment base would be linked to various energy projects in the area. Any new town, including this one, which would require any federal or other government support (permits, funding or financing) would be non-discriminatory regarding race, ethnicity and other factors. Therefore, this possible New Town would be available to house Navajos and others who may choose to live there.

Comment. If PNM obtains the land for the possible New Town in the exchange, would other grazing land be provided for Mr. Blackie to lease? (186, 484.)

Response. Portions of two BLM grazing allotments are present on the possible New Town site. The Black Lake allotment (allotment No. 6010) is leased by BLM to Paragon Resources, Inc., and encompasses approximately 2½ sections of the site. The Otis community allotment (allotment No. 6011) is held by the Navajo Tribe and administered by BIA through a cooperative agreement dated September 15, 1978. The grazing leases on these lands would likely be cancelled should the Ute Mountain Land Exchange be approved. Relocation of the grazing preference of Navajo operations lost is not possible as all public grazing use areas in the Chaco vicinity are presently allocated for grazing. The Navajo Tribe would have protest and appeal rights on the proposed and final decision under CFR 4160.2 and 4160.4.

In a letter from the President of Paragon Resources, Inc., to the District Manager of the BLM Albuquerque District (July 22, 1981) the following relevant comment was made and reported in the Ute Mountain Land Exchange EA:

> Grazing Leases--BLM proposes not to include lands for exchange where grazing lease conflicts exist except as a last resort. Our position holds that a better approach is to: (1) allow Paragon and other lease holders to come to a mutually acceptable exchange for grazing leases which Paragon currently holds in the area or (2) other mutually acceptable arrangements as can be negotiated, such as outright purchases. Since several areas of "conflict" grazing leases are located over existing or proposed subsurface mineral leases, exchange or sale of such grazing leases would actually serve to reduce future mining/ranching conflicts in the area. Paragon does not advocate a forced exchange where mutually satisfactory arrangements cannot be negotiated.

Comment. (a) What possible future industrial developments does PNM envision and where would the water to supply them come from? (I-1); (b) If access to a new town would be through existing roads, why does PNM hold out the prospect of a future EIS on ROWs for the town? (I-1); (c) If 2000 people would only be the "initial population" of the town, why does BLM not conduct a worst-case analysis based on the reasonably foreseeable population of the town (III-1)?; (d) How can the Westwater member of the Morrison Formation supply water for the town (III-2) when it has total dissolved solids exceeding water quality criteria for livestock watering and irrigation (p. 2-31)? (484.)

Response. (a) PNM's proposed industrial development is the construction of NMGS, with a proposed water source of the San Juan River. Other possible uses of the remaining exchange lands would be grazing, a possible New Town and a water wellfield. These uses have been addressed in the EIS.

(b) As was stated on DEIS pp. 3 and I-1, should a New Town development become feasible, applications for ROWs across public lands would be needed to provide a town with utilities and other community facilities. These proposals would then be subject to the full NEPA process.

(c) The general impact analysis of the possible New Town as a possible end use of the Ute Mountain Land Exchange included the range of population of 2000-20,000. The analysis is intended to describe the types and possible magnitude of potential impacts.

(d) As was stated on DEIS p. II-3, the water from this aquifer would generally not be suitable for municipal water supply or irrigation without some type of treatment.

CHANGES TO THE TECHNICAL REPORTS

Since the time of the filing of the Draft EIS in November 1982, revised information from the applicant or from public and agency comments has become available and has been incorporated into the EIS. The following represents changes to the wording in some Technical Reports. The Technical Reports are the basis for the information and analysis contained in the EIS.

The changes are grouped using the title of the Technical Report. Changes are included for the Reports covering Hydrology, Vegetation, Wildlife and Aquatic Biology, Threatened and Endangered Species, Visual Resources, Recreation Resources, Wilderness Values, and Social and Economic Conditions.

Changes to the Technical Reports are included in the EIS in order to ensure the widest distribution possible. The Technical Reports themselves are available as indicated on page 4-144.

Hydrology

Change p. 3-11 to end the sentence at bottom of page with: is not clear. Change p. 3-12, first clause, to read: "Another opinion by the Solicitor of the Department of the Interior was prepared on April 23, 1982 (Memorandum from William H. Coldiron, Solicitor, to Assistant Secretary - Land and Water Resources; subject: Navajo Indian Irrigation Project). This opinion concluded in part that stream depletions (required diversions up to a maximum of 508,000 ac-ft less return flows) set the limit for Navajo beneficial water use on NIIP."

Change p. 3-38, last paragraph, to add at end of paragraph: Based on the Second Amendatory Contract between Utah International and the United States signed on August 31, 1982, the Utah International contract would still be in effect if the term of the contract is extended beyond 2005. However, in no event would the term of the Utah International contract be extended beyond August 31, 2022.

Change p. 3-38, last paragraph, last sentence, to read: beyond its 2005 ending date (total consumptive use of contract is 16,200 ac-ft/yr).

Change p. 3-43, first paragraph, to add: The making of a new contract with PNM for 15,000 ac-ft/yr of water from Navajo Reservoir has the potential of precluding other municipal and industrial uses of water during the term of the contract.

Change p. 3-14, Table 3-1, the paragraph in the "Remarks" row that reads, "Flow completely regulated by Navajo Dam...." to move to the most right-hand column (period of record of "1962 to 1981").

Change p. 3-26, the fifth line from the top of the page, to read: As discussed in Section 3.C.2, this project is....

Change p. 3-37, the ninth line from the top of the page, to read: 3-3). This yield of....

Change p. 4-78, Table 4-8, to add:

	Pumping Rate (cfs)					Model
Gallup	1955-1959	1960-1964	1965-1969	1970-1974	1975-1980	Node Number
	.26	.52	.73	.94	.76	3,26,6
	.26	.52	.73	.94	.76	3,27,5

Change p. 4-78, to add: "model node number" 3,16,6 to the Navajo Tract Well 14T-515. The "model node number" for the Mariano Lake Mine should be corrected to 3,26,12.

Change p. 4-78, Table 4-8 to delete the column under "Data Source.[3]" References for the sources of data on which groundwater withdrawals are based are cited in Table E-1.

Change p. 9-1. The ground-water supply alternative should indicate "YES" under the column, "irreversible commitment of resources." The footnote at the bottom of the table should be deleted (it is redundant).

Water Quality

Change p. 3-18, paragraph 2, to add: An individual Section 404 permit is required if temporary structures are to be constructed using material other than that excavated from the trench. There are nationwide permits for minor road crossings and discharges less than 10 cubic yards. No reports or statements of intent are required to use nationwide permits. The only requirement is that the person responsible for the project assures compliance with all conditions of the permit.

Change p. 5-11, Table 5-3, to add the following 86 toxic pollutants:

acrolein
acrylonitrile
aldrin
benzene
benzidine
carbon tetrachloride
chlordane
chlorinated benzenes
    monochloro benzene
    hexachor benzene
    pentachloro benzene
    1,2,45-tetrachlorobenzene
chlorinated ethanes
    1,2-dichloroethane
    hexachoroethane
    1,1,2,2-tetrachloroethane
    1,1,1-trichloroethane
    1,1,2-trichloroethane
chlorinated phenols
    2,4-dichlorophenol
    2,4,5-trichlorophenol
    2,4,6-trichlorophenol
chloroalkyl ethers
    bis (2-chloroethyl) ether
    bis (2-chloroisopropyl) ether
chloroform
DDT
dichlorobenzene
1,1-dichloroethylene
dichloropropenes
dieldrin
2,4-dinitrotoluene
diphenyl hydrazine
endosulfan
endrin
ethyl benzene
halo methanes
    bromodichloromethane
    bromomethane
    chloromethane
    dichlorodifluoromethane
    ichloromethane
    tribromo methane
    trichlorofluoromethane
heptachlor
hexachlorobutadiene
hexachlorocyclohexane (HCH)
    alpha - HCH
    beta - HCH
    gamma - HCH
    technical HCH
hexachlorocyclopentadiene
isophorone
nitrobenzene
nitrophenols
    2,4-dinitro-o-cresol
    dinitro phenols
nitrosamines
    N - nitrosodiethylamine
    N - nitrosodimethylamine
    N - nitrosodibutylamine
    N - nitrosodiphenylamine
    N - nitrosopyrolidine
pentachloro phenol
phenol
phthalate esters
    dibutyl phthalate
    di-2-ethylhexyl phthalate
    diethyl phthalate
    dimethyl phthalate
polychlorinated biphenyls (PCBs)

polynuclear aromatic hydrocarbons (PAH)
- anthracene
- 3,4-benzofluoranthene
- benzo (k) fluoranthene
- fluoranthen
- fluorane
- phenanthrene
- pyrene

tetrochloroethylene
toluene
toxaphene
trichloroethylene
vinyl chloride

Change p. 5-40 regarding the estimated maximum velocity of alluvial ground water from 3.3 ft/yr to 12 ft/yr. In addition, the estimated maximum net movement of alluvial ground water (assuming a similar hydraulic gradient) should be changed from less than a few hundred feet to less than 500 feet over the expected 40-year life of project facilities.

Change p. A-1, title for Appendix A, to read: The Antidegradation Policy and the General Standards of the New Mexico Water Quality Standards. Change p. 3-4, Table 3-2: "designated" should be substituted for "beneficial." Change p. 3-4, Table 3-2, columns 3-9: "Water quality criteria" should be substituted for "water quality standards."

Change p. 3-8, first paragraph, first sentence to read: Salinity is regulated in this reach of the San Juan River, even though there are no recommended water quality criteria for salinity in this reach of the river.

Vegetation

Change p. 3-41, last paragraph to add: Four special status species, Astragalus fucatus, Abronia bigelovii, Mamillana wrightii, and Pediocactus papyracanthus, are known or suspected to grow near proposed or alternative project components.

Astragalus knightii

This plant was recently discovered in New Mexico. Its known occurrence is limited to an area west of the proposed Rio Puerco Station (NMGS transmission system). It is associated with sandy soils derived from the Dakota series in ledges and sandstone pockets of rimrock habitats.

As a special status plant, surveys will be conducted on the selected transmission line routes and provisions made to avoid or mitigate impacts. Areas of potential habitat are T13 to 15N, and R2 and 3W.

Penstemon parviflorus

This plant has only been verified once in extreme southwest Colorado in 1892. The New Mexico Heritage Program has located specimens currently being studied that may be this species (from San Juan County, New Mexico). The original collection is from the "upper Sonoran zone," Montezuma, Colorado.

Wildlife and Aquatic Biology

Change p. 3-3, first line to read: Mammals whose preferred habitat includes ponderosa habitat (BLM 1978b) include long-legged myotis, small-footed myotis, silver-haired bat, big brown bat, eastern cottontail, Colorado chipmunk, Mexican woodrat, bushy-tailed woodrat, montane vole, Mexican vole, porcupine, mule deer, elk, and black bear.

Change p. 3-4, last paragraph, second sentence to read: Mammals reported from grassland and sagebrush-greasewood habitat types include pronghorn antelope, and Gunnison's prairie dog (BLM 1978).

Change p. 3-5, first sentence, to add: Birds found in these habitat types include scaled quail, Gambel's quail, rock dove, mourning dove, red-headed woodpecker, Baird's sparrow, and the golden eagle.

Change p. 3-6, second sentence, to delete: bear.

Change p. 3-8, second paragraph, first sentence to read "water fowl", not "water owls."

Change p. 3-16, last sentence, to read: Prairie Dogs. Prairie dog towns are reported between MP 29-31.

Change p. 3-33, last sentence to add: (Ramakka, 1981b).

Page 3-43, second sentence, is deleted.

Change p. 3-37, fifth paragraph, first sentence to add: "(occasional sightings)" after "peregrine falcon."

Change p. 3-53, second sentence, to read: Graul and Webster (1976) reported that in Colorado the mountain plover tended to nest on blue-grama-buffalo grass flats, although Tolle (1976) reported that in New Mexico the mountain plover nested in "the basin sagebrush bio-association."

Change p. 4-5, Table 4-1, source, to read: Source: NMGS Social and Economic Conditions Technical Report.

Change p. 4-7, second paragraph, to read: Prairie Dogs. Prairie dogs are reported only along transmission corridor T2; they are discussed in Section 4.5.1.

Change p. 4-14, fourth paragraph to read: Prairie Dogs. Prairie dog towns are discussed in Section 4.5.1.

Page 7-1, second paragraph, first sentence, is deleted.

Change p. 7-1, second paragraph, last sentence to read: Long-term productivity would not be impaired by increased hunting and fishing pressure assuming adequate management and resources committed to replacement of harvested species.

Change p. 2-1, fourth paragraph, first sentence to read: If Mesa Verde cactus is present or in areas that may be affected because of increased recreational use or because of ORV activities, potential impacts could include: ....

Change p. 3-1, line 12, to read: ... wildlife species that are unique and/or highly valued in the region and meet one or more of the four categories on p. 2-2.

Change p. 3-1, line 17, to read: ...other wildlife-i.e., those that do not meet one or more of the four criteria on p. 2-2.

Change p. 3-28, line 20, to read: Koster (1957) did report...(the red shiner) as occurring in New Mexico, but not in the San Juan River....

Threatened and Endangered Species

The Threatened and Endangered Species TR was used to develop the Biological Assessment (see Appendix H).

Change p. 1-15, second full paragraph, line 6, to read: ...under the Wildlife Conservation Act and are discussed in the Wildlife TR.

Change p. 3-27, Table 3-4, between Centrarchidae and Cottidae, to add:

Percidae	Perch
Etheostema exile	Iowa Darter

Visual Resources

Change p. 2-9, Map 2-1, to correct title to read: southeast.

Recreation Resources

Change p. 3-19, first paragraph, fourth line to read: Camping, hunting, picnicking, and fishing are the primary recreation activities in the ranger districts.

Change p. 3-22, last paragraph, seventh line to read: It offers boating, fishing, hunting, and water skiing and provides camping-picnicking units with benches, tables, and fireplaces as well as parking pads for trailers, modern restrooms, rental boats, mooring lines, marine supplies, and a modern marina with launching ramp.

Change p. 3-25, first paragraph, first sentence, to delete: Easement.

Change p. 3-27, second paragraph, first line to read: Most activities in the study area are of the dispersed type (i.e., sightseeing, ORV use, hunting, fishing, hiking).

Change p. 3-27, last paragraph, first line to read: The BLM has rated the study area for a variety of recreation opportunities, including hunting.

Change p. 4-7, second paragraph, first line, to read: This increase could add a significant demand to nearby resources such as the Navajo Reservoir, and San Juan River quality water which is already experiencing rapid increases in participation rates.

Wilderness Values

Change p. 5-2 to add:

- Increase BLM's management and use of WSAs as visitor use increases. Manage access and use of WSA; potentially impacted.

- Have applicant (PNM) organize planned field trips for employees and families to visit WSAs. Include supervision and ridesharing as part of planned visits to minimize impacts of visitors to these areas.

Social and Economic Conditions

Change p. 3-6, paragraph 2, line 3 to read: In 1980, approximately 34,000 Native Americans lived on parts of the Navajo and Zuni reservations contained within San Juan and McKinley counties, and approximately 10,000 more lived in or near urban areas. In addition, about 19,900 (or 31.6 percent of the total two-county Native American population) resided in the checkerboard area adjacent to the Navajo Reservation.

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WOODWARD-CLYDE CONSULTANTS (WCC)

Woodward-Clyde Consultants was selected to assist the BLM in preparing this EIS during a selection process conducted in the autumn of 1980. In accordance with CEQ Regulations (1506.5(c)): the contractor was solely selected by the lead agency; the contractor executed a disclosure statement specifying that it has no financial or other interest in the outcome of the project; and the lead agency provided guidance throughout the development of the EIS and has responsibility for its scope and content. WCC has previously worked in this arrangement for the BLM; for the New Mexico State Office in particular, this consultant prepared with BLM, an EIS called MAPCO's Liquid Hydrocarbon Pipeline EIS (Draft, 1980; Final, 1980). This consultant has also worked previously for the Public Service Company of New Mexico (PNM). During the period 1974-76, WCC

worked intermittently on a PNM siting study to identify candidate siting areas for a 2500 MW coal-steam generating station. That study was used by PNM as one basis for selecting the New Mexico Generating Station site which is the subject of this EIS. Contractor preparers are listed below.

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WCC Preparer	EIS Responsibility	Education	Years Related Experience
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Personnel from formal and informal Cooperating Agencies:

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* Minerals Management Service (onshore functions) has now been merged with the BLM.

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Aztec, New Mexico
Cuba, New Mexico
Gallup, New Mexico
Grants, New Mexico
Rio Rancho, New Mexico

Department of Energy
Federal Energy Regulatory Commission

Department of the Interior
Bureau of Indian Affairs
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Window Rock, Arizona

Albuquerque, New Mexico
Shiprock, New Mexico
Bureau of Land Management
Washington Office
New Mexico State Office
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Environmental Protection Agency
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Region VIII Office, Denver
Region IX Office, San Francisco

Nuclear Regulatory Commission

U.S. Army Corps of Engineers
Albuquerque District

Water Resources Council
Washington, D.C.

* Minerals Management Service (onshore functions) has now been merged with the BLM.

INDIAN TRIBES

Acoma Pueblo
Cochiti Pueblo
Isleta Pueblo
Jemez Pueblo
Jicarilla Apache
Laguna Pueblo
Navajo Tribe
Sandia Pueblo
San Felipe Pueblo
Santa Ana Pueblo
Santa Domingo Pueblo
Zia Pueblo
Zuni Pueblo

STATE OF NEW MEXICO

A-95 Clearinghouses
Bureau of Mines and Mineral Research
Energy and Minerals Department
Environmental Improvement Division
Natural Resources Department
- Department of Game and Fish
- Interstate Stream Commission
- State Engineer
- State Heritage Program
Public Service Commission
Soil and Water Conservation Districts
State Archaeologist
State Highway Department
State Historic Preservation Officer
State Land Office

UNIVERSITIES, COLLEGES, AND RESEARCH INSTITUTIONS

Arizona Museum of Natural History
Eastern New Mexico University
Museum of Northern Arizona
New Mexico Energy Institute
New Mexico Institute of Mining and Technology
New Mexico Museum of Natural History
New Mexico Solar Energy Institute
New Mexico Technical Institute
University of Arizona

University of California, Berkeley
University of Kansas
University of New, Mexico, Albuquerque
University of New Mexico, Las Cruces
U.S. National Museum, Smithsonian Institution

LOCAL

City of Aztec
City of Bloomfield
City of Farmington
- Municipal Schools
- Police Department

McKinley Area Council of Governments
McKinley County
San Juan County
- Human Services Department, Social Services Division
- Sheriff's Department

OTHER

Upper Colorado River Commission, Salt Lake City
San Juan Generating Station Personnel Department

LIST OF TECHNICAL REPORTS

1. Purpose and Need
2. Project Description
3. Alternatives to the Project
4. Site Alternatives
5. Permit Reconnaissance
6. Air Quality
7. Geologic Setting
8. Mineral Resources
9. Paleontology
10. Soils, Prime and Unique Farmlands
11. Hydrology
12. Water Quality
13. Vegetation
14. Wildlife and Aquatic Biology
15. Threatened and Endangered Species
16. Cultural Resources
17. Visual Resources
18. Recreation Resources
19. Wilderness Values
20. Transportation
21. Social and Economic Conditions
22. Land Use Controls and Constraints

AVAILABILITY OF TECHNICAL REPORTS, DEIS, AND FEIS FOR PUBLIC REVIEW

Individual copies of the documents are available for a copy fee through:

Bureau of Land Management, New Mexico State Office
Title Records and Public Assistance Section (943B)
U.S. Post Office and Federal Building
P.O. Box 1449
Santa Fe, NM 87501
(505) 988-6107 FTS 476-6107

Copies of the reports were made available for public review at the locations below. (Formal and informal cooperating agencies are denoted by an asterisk [*].)

BUREAU OF LAND MANAGEMENT OFFICES

New Mexico State Office

Public Affairs Staff (912)
Room 2016
U.S. Post Office and Federal Building
P.O. Box 1449
Santa Fe, NM 87501
(505) 988-6316 FTS 476-6316

Division of Resources (930)
509 Camino de los Marquez, Suite 3
P.O. Box 1449
Santa Fe, NM 87501
(505) 988-6212 FTS 476-6212

Albuquerque District Office
3550 Pan American Freeway NE
P.O. Box 6770
Albuquerque, NM 87107
(505) 766-2455 FTS 474-2455

Farmington Resource Area Headquarters
900 La Plata Road
P.O. Box 568
Farmington, NM 87401
(505) 325-3581

Taos Resource Area Office
Montevideo Plaza
P.O. Box 1045
Taos, NM 87571
(505) 758-8851

Las Cruces District Office
1705 North Valley Drive
P.O. Box 1420
Las Cruces, NM 88001
(505) 524-8551 FTS 571-8312

Socorro Resource Area Office
198 Neel Avenue
P.O. Box 1219
Socorro, NM 87801
(505) 835-0412 FTS 476-6280

Roswell District Office
1717 West Second Street
P.O. Box 1397
Roswell, NM 88201
(505) 622-7670 FTS 476-9251

Carlsbad Resource Area Headquarters
114 South Halagueno Street
P.O. Box 506
Carlsbad, NM 88220
(505) 887-6544

OTHER DEPARTMENT OF THE INTERIOR AGENCIES

Bureau of Indian Affairs*
Albuquerque Area Office
123 Fourth Street
P.O. Box 2088
Albuquerque, NM 87198
(505) 766-3374 FTS 474-3374

Bureau of Indian Affairs*
Eastern Navajo Agency
P.O. Box 328
Crownpoint, NM 87313
(505) 786-5228

Bureau of Indian Affairs*
Navajo Area Office
Box M - Mail Code 305
Window Rock, AZ 86515
(602) 871-5151 FTS 479-5314

Bureau of Reclamation*
Upper Colorado Regional Office
125 S. State Street
P.O. Box 11568
Salt Lake City, UT 84147
(801) 524-5463 FTS 588-5463

National Park Service*
Resource Evaluation Office
411 N. Auburn
Farmington, NM 87401
(505) 327-7397 FTS 572-6254

National Park Service*
Southwest Regional Office
1100 Old Santa Fe Trail
Santa Fe, NM 87501
(505) 988-6375 FTS 476-6375

National Park Service*
Environmental Coordination Office
Pinon Building, 1220 St. Francis Drive
P.O. Box 728
Santa Fe, NM 87501
(505) 988-6681 FTS 476-6681

U.S. Fish And Wildlife Service*
Field Supervisor, Ecological Services
3530 Pan American Highway, Suite C
Albuquerque, NM 87107
(505) 766-3966 FTS 479-3966

U.S. Geological Survey (WRD)*
505 Marquette Avenue, Room 720
Albuquerque, NM 87101
(505) 766-2810 FTS 474-2817

OTHER FEDERAL AGENCIES AND ORGANIZATIONS

Environmental Protection Agency*
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1201 Elm Street
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(214) 767-2716 FTS 729-2716

Navajo Tribe*
c/o Division of Resources
P.O. Box 308
Window Rock, AZ 86515
(602) 871-6592

Pueblo of Zia*
General Delivery
San Ysidro, NM 87053
(505) 867-3304

Soil Conservation Service*
424 N. Mesa Verde
Aztec, NM 87410
(505) 334-9437

U.S. Corps of Engineers*
P.O. Box 1580
Albuquerque, NM 87103
(505) 766-2657 FTS 474-2657

USDA, Forest Service*
717 Gold Avenue
Albuquerque, NM 87102
(505) 474-1676 FTS 474-1676

USDA, Forest Service*
District Ranger
Mt. Taylor Ranger District
201 Roosevelt Avenue
Grants, NM 87020
(505) 287-8833

USDI, Bureau of Land Management
Division of Rights-of-Way (330)
18th and C Streets, NW
Washington, D.C. 20240
(202) 343-5441 FTS 343-5441

USDI, Bureau of Land Management
Denver Service Center (D-460)
Technical Publications Library
Denver Federal Center, Bldg. 50
Denver, CO 80225
(303) 234-2368 FTS 234-2368

NEW MEXICO STATE AGENCIES

New Mexico State Environmental Improvement Division*
725 St. Michaels Drive
P.O. Box 968
Santa Fe, NM 87503
(505) 827-5217, ext. 2416

New Mexico Energy and Minerals Department*
525 Camino de los Marquez
P.O. Box 2770
Santa Fe, NM 87503
(505) 827-3326

New Mexico Historic Preservation Bureau*
State Historic Preservation Officer
505 Don Gaspar Avenue
Santa Fe, NM 87503
(505) 827-2108

New Mexico Natural Resource Department*
Villagra Building
Santa Fe, NM 87503
(505) 827-5531

New Mexico Public Service Commission*
Bataan Memorial Building
Santa Fe, NM 87503
(505) 827-3361

New Mexico State Engineer's Office*
Bataan Memorial Building
Santa Fe, NM 87503
(505) 827-2423

New Mexico State Planning Office*
505 Don Gaspar Avenue
Santa Fe, NM 87503
(505) 827-5191

OTHER ORGANIZATIONS

Public Service Company of New Mexico
Alvarado Square
P.O. Box 2268
Albuquerque, NM 87158
(505) 848-2700

Woodward-Clyde Consultants
One Walnut Creek Center
100 Pringle Avenue
Walnut Creek, CA 94596

Southwest Research and Information Center
P.O. Box 4542
Albuquerque, NM 87106

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Albuquerque Public Library
501 Copper Avenue NW
Albuquerque, NM 87102

Aztec Public Library
201 W. Chaco
Aztec, NM 87401

Crownpoint Community Library
c/o Lioness Club, P.O. Box 731
Crownpoint, NM 87313

Cuba Public Library
Box 5, La Jara
Cuba, NM 87027

Farmington Public Library
302 N. Orchard
Farmington, NM 87401

Gallup Public Library
115 W. Hill Avenue
Gallup, NM 87301

Mother Whiteside Memorial Library (Public)
525 W. High Street
P.O. Box 96
Grants, NM 87020

New Mexico State Library
325 Don Gaspar Avenue
Santa Fe, NM 87503

Harwood Foundation Library (Public)
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P.O. Box 766
Taos, NM 87571

University/College Libraries

University of New Mexico
General Library
Albuquerque, NM 87131

Navajo Community College Library
Shiprock Branch
P.O. Box 580
Shiprock, AZ 87420

Northern New Mexico Community College
P.O. Box 250
Espanola, NM 87532

University of New Mexico, Gallup Campus
Learning Resources Center
200 College Road
Gallup, NM 87301

New Mexico State University/Grants
1500 Third Street
Grants, NM 87020

New Mexico Highlands University
Donnelly Library
National Avenue
Las Vegas, NM 87701

College of Santa Fe
Fogelson Memorial Library
St. Michaels Drive
Santa Fe, NM 87501

New Mexico State University
San Juan Campus
4601 College Blvd.
Farmington, NM 87401

Acid precipitation Refers to precipitation with pH lower than 5.6. Precipitation is naturally somewhat acidic (with a pH of about 5.6) because of the dissolution of atmospheric carbon dioxide to form carbonic acid. Precipitation with a pH lower than 5.6 is indicative of substances other than CO_2 causing the acidity. Sulfuric, nitric, and, to a lesser extent, hydrochloric acid, contribute to the lower pH values of acid precipitation. It is generally recognized that fossil fuel combustion forms precursors to acid precipitation, although its importance is not clear.

Alkaline Having a pH of more than 7.

Alluvium Clay, silt, sand, and gravel or other rock material transported by flowing water and deposited as sorted or semisorted sediments.

Ambient In the case of air quality, the portion of the atmosphere external to buildings, to which the general public has access.

Ambient pollutant concentrations Existing levels of contaminants in the local or regional air, usually pertaining to concentrations of particulate matter, sulfur dioxides, nitrogen oxides, ozone, and trace elements.

Aquifer One or more formations that contain sufficient permeable material to yield significant quantities of water to wells and springs.

Arroyo Small, deep, flat-floored channel or gully of an ephemeral or intermittent stream, usually with vertical or steeply cut banks of unconsolidated material.

Attainment A designation issued by the EPA to indicate an area's compliance with all applicable National Ambient Air Quality Standards (NAAQS). An area that is in compliance with the particulate matter standard, for example, is termed "attainment" for this pollutant. An area that is shown by monitoring or modeling to exceed a standard is designated "non-attainment" for the particular pollutant(s).

Backfill Earth that is replaced after a construction excavation.

Badlands A region nearly devoid of vegetation where erosion, instead of carving hills and valleys of the ordinary type, has cut the land into an intricate maze of hollow ravines and sharp crests and pinnacles.

Baseline Air quality, water quality, or meteorological data used as a starting point in estimating the impact of new emissions.

Bedrock A general term for the rock, usually solid, that underlies soil or other consolidated, superficial material.

Biochemical Characterized by, produced by, or involving chemical reactions in living organisms.

Biomass energy technology A process of generating energy utilizing biomass (solid waste, agricultural, and forest residues, etc.) as the fuel. The biomass can be burned to generate heat that warms a boiler and creates steam, or it can be fermented and distilled to make clean-burning fuels such as methanol.

Biota The plant and animal life in an area.

Blowdown The quantity of recirculating cooling water that is discharged on a continuous basis in order to control the gradual buildup of dissolved and suspended substances in a closed-cycle cooling system.

Borrow area Area from which earth material is obtained for use elsewhere.

Breakers (placed over pipe for erosion control)

Candidate species A species that is being reviewed by the Fish and Wildlife Service to determine if there is sufficient cause to propose the species for inclusion as threatened or endangered on the federal list.

Category 1,2 species Category 1 status review species are plant species that are officially recognized by the Fish and Wildlife Service as high-priority candidates for federal threatened and endangered status but have not yet been formally proposed. Category 2 status review species are plant species that are lower-priority candidates than category 1 for federal threatened and endangered listing, due to lack of biological information.

Cathodically protected Protected against corrosion by means of a weak electric current applied to the pipeline to offset the galvanic action causing metal corrosion.

Chlorinated Treated with chlorine or a chlorine compound; e.g., used for purification of water.

Cooling tower A towerlike device in which atmospheric air circulates and cools warm water, generally by direct contact (evaporation).

Cretaceous The final period of the Mesozoic era thought to have covered the span of time between 135 and 65 million years ago.

Crucial winter range Range that is crucial to game (usually big game) survival because it provides browse and cover during winter months when other habitat is not able to provide for these crucial needs.

Cultural resources Remains of human activity, occupation, or endeavor, as reflected in sites, buildings, artifacts, ruins, etc.

Cut-and-fill Excavation and grading operation entailing achievement of uniform grade by moving excess material from hills into valleys.

Decibel A unit for expressing the relative intensity of sounds on a scale from 0 (for the average least perceptible sound) to about 130 (for the average pain level).

Decommissioning The act of taking a power generating or industrial facility out of service, sometimes referred to as mothballing.

Dike Berm or embankment designed to contain a body of water.

Dissected plateaus A plateau in which a large part of the original surface has been deeply cut by streams.

Diurnal Occurring in the daytime.

Downwash (air movement) The downward deflection of air, relative to the direction of motion of an airfoil.

Drawdown The decline in the potentiometric head in an aquifer at a specified period of time. Drawdown is also defined as the difference between the elevation of the water level in a well under non-pumping (static) conditions and the elevation under pumping conditions.

Drift (tower water) The water lost in a cooling tower as mist or droplets entrained by the circulating air, not including the evaporative loss.

Econometrics The use of sophisticated mathematical, statistical, and other analytic methods to make quantitative economic analyses.

Effluent The mixture of substances, gases, liquids, and suspended matter discharged into the atmosphere (or ground, river, ocean) as the result of a given process.

Electromagnetic Related to magnetism developed by electric current.

Electrostatic precipitator A means of removing particulates from gases. Particles are given an electrical charge and attracted to a plate with an opposite charge.

Emission A substance, whether gaseous or particulate, released by human activity into the air or water.

Endangered species Any species that is in danger of extinction throughout all or a significant portion of its range (Endangered Species Act, 1973).

Entrainment To draw in and transport by the flow of a fluid.

Ephemeral stream A stream or reach of a stream that flows briefly only in direct response to precipitation in the immediate locality and whose channel is at all times above the water table.

Erosion The general process or processes whereby rock material is loosened, dissolved, or worn away, and simultaneously moved from one place to another by natural agencies.

Ethnography Descriptive anthropology; science that deals with the division of people into races and their origin, distribution, relations, and characteristics.

Evaporation ponds Large ponds where used water, degraded to the extent that is cannot be treated for further in-plant use, is discharged.

Exogenous Originating from or due to outside causes.

Extirpation Complete destruction; extermination.

Fault Fracture in the earth's crust accompanied by displacement of one side of the fracture with respect to the other and in a direction parallel to the fracture.

Fault trace The surface expression of a fault plane.

Floodplain Lands that are periodically covered by flood waters.

Fugitive dust Particulate matter composed of soil which is uncontaminated by pollutants resulting from industrial activity.

Geologic unit A recognizable rock unit based either on its lithologic (mappable) or its time-stratigraphic characteristics; a discrete body of rock recognizable by unique characteristics.

Greenhouse effect Warming of the earth's surface and the lower layers of atmosphere that tends to increase with increasing atmospheric carbon dioxide and that is caused by conversion of solar radiation into heat in a process involving selective transmission of shortwave solar radiation by the atmosphere, its absorption by the earth's surface, and reradiation as infrared which is absorbed and partly reradiated back to the surface by carbon dioxide and water vapor in the air.

Ground water That part of the subsurface water that is the zone of saturation, supplies water to wells, and provides water that sustains the low flow of perennial streams.

Grouting Injection of soil or rock with chemicals, cement, or other materials to improve the strength or reduce the permeability.

Intake The place at which a liquid (primarily water) is taken into a pipe, channel, etc.

Intermittent stream (a) A stream or reach of a stream that drains a watershed of at least 1 square mile, or (b) a stream or reach of a stream that is below the local water table for at least some part of the year, and obtains its flow from both surface runoff and ground-water discharge.

Lithologies The physical character of rocks including color, mineralogic composition, and grain size.

Magnetohydrodynamics Of or relating to phenomena arising from the motion of electrically conducting fluids in the presence of electric and magnetic fields.

Main power block The main power block consists of a series of generating units that include the turbine generator, boiler, particulate removal system, and chimney stack.

Matrilineal Tracing descent through the maternal line.

Matrilocal Located at or centered around the residence of the wife's family or people.

Multiple regression A regression in which one variable is estimated by the use of more than one other variable.

Nitrogen dioxide A molecule of one nitrogen and two oxygen atoms: NO_2.

Nitrogen oxides (NO_x) Compounds produced by combustion, particularly when there is an excess of air or when combustion temperatures are very high. Nitrogen oxides are primary air pollutants.

Nominal rating A designated or theoretical output that may vary from the actual.

Nonattainment area An area already characterized by significant levels of air pollution. Such areas are restrictive of any significant increases in certain pollutants caused by new sources (industrial or power plant).

100-year flood level The flood level with a 1 percent probability of occurring within any given year based on past recorded floods or computed drainage flows.

Overburden The earth, rock, and other materials that lie above a mineral deposit.

Ozonated Treated or combined with ozone (O_3).

Ozone A molecule of three oxygen atoms: O_3.

Paleocene An epoch of the early Tertiary period and the corresponding worldwide series of rock.

Paleontology A science that deals with the life of past geological periods and is based on the study of fossil remains of plants and animals.

Particulate matter Any material, except water in a chemically uncombined form, that is or has been airborne and exists as a liquid or a solid at standard temperature and pressure conditions. Minute particles of coal dust, fly ash, and oxides temporarily suspended in the atmosphere.

Percolation Slow movement of water through small openings within porous material such as sandstone.

Perennial stream a stream or part of a stream that flows continuously during all of the calendar year as a result of ground-water discharge or surface runoff. The term does not include intermittent stream or ephemeral stream.

pH A number that represents the negative logarithm, base 10, of the hydrogen-ion activity of a solution. A pH less than 7 indicates an acid solution; a pH greater than 7 indicates an alkaline solution.

Plume The volume of air space containing any of the substance emitted from a point source. For practical purposes, the limits of a plume have to be arbitrarily defined according to some minimum concentrations of the substance.

Potentiometric surface A surface that represents the static water level or head in an aquifer. In a confined aquifer, it is defined by the levels to which water will rise in tightly cased wells. The water table is a particular potentiometric surface.

Prehistory The time before written history.

Prime or unique farmland Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for these uses (e.g., not urban built-up land). Numerous specific SCS criteria must be met for a soil to qualify as potential Prime Farmland. For a soil to qualify as Prime Farmland (in the NMGS project area in New Mexico), it must meet the specific criteria and be irrigated. Unique Farmland is land other than Prime Farmland that is used for the production of specific high-value food and fiber crops. It has the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality and/or high yields of a specific crop when treated and managed according to acceptable farming methods.

Quarternary The second period of the Cenozoic era as well as the corresponding system of rocks. It began two to three million years ago and extends to the present.

Radionuclides A radioactive nuclide.

Raptor Predatory bird, such as the eagle, hawk, or owl.

Regime (temp., nutrient, etc.) The characteristic behavior or orderly procedure of a natural phenomenon or process.

Riparian Relating to or living on the bank of a river, pond, lake or stream.

Riprap A foundation or sustaining wall of stones (as on an embankment slope) to prevent erosion.

Saline A general term of the naturally occurring soluble salts, such as common salt, sodium carbonate, sodium nitrate, potassium salts, and borax.

Sandstone Any clastic sedimentary rock containing individual particles that are visible to the unaided eye or slightly larger.

Scaling Thin coating, layer, or incrustation; hard incrustation that builds on side of boiler vessel.

Secondary effects Derived from original, or primary, effects.

Sedimentation The process of forming or accumulating sediment in layers.

Sedimentary Rocks that are formed by the deposition of a sediment.

Shale A fine-grained sedimentary rock formed by the consolidation of clay silt or mud. It is characterized by a finely laminated structure which imparts fissility parallel to bedding.

Siltation The deposition or accumulation of silt that is suspended throughout a body of standing water.

Siltstone An indurated silt having the texture and composition of shale but lacking its fine lamination or fissility.

Sludge A semifluid, slushy, murky mass of sediment resulting from treatment of water, sewage, or industrial and mining wastes.

Spoil Material that has been removed from its original location by mining operations and that is unacceptable for structural fill.

State-listed species Species that are classified by a state as threatened, endangered, rare, or otherwise restricted in distribution and number. Classifications do not necessarily correspond to Fish and Wildlife listings. These species are legislatively protected only if specific state statutes have been approved.

Strata Layers of sedimentary rock visually separable from other layers above and below.

Stringing pipe Placing joints of pipe end-to-end along a pipeline right-of-way in preparation for welding the joints together to form a pipeline.

Subbituminous coal A black coal intermediate in rank between lignite and bituminous coals.

Subsidence Movement in which surface material is displaced vertically downward.

Substrate Soil, organic, and/or rock materials found on the bottom of aquatic habitat.

Sulfur dioxide (SO_2) Heavy, pungent, toxic gas that is easily condensed to a colorless liquid, is used in making sulfuric acid, and is a major air pollutant, especially in industrial areas.

Tectonic A branch of geology dealing with the regional assembling of structural or deformational features; a study of their mutual relations, origin, and historical evolution.

Tertiary The first period of the Cenozoic era, thought to have covered the time span between 65 and 3 to 2 million years ago.

Thermochemical The interrelation of heat with chemical reaction on physical change of state.

Threatened species Any animal or plant species likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Tiering Incorporation of the existing data base by reference to relevant environmental documents.

Total dissolved solids (TDS) An aggregate of carbonates, bicarbonates, chlorides, sulfates, phosphates, and nitrates of calcium, magnesium, manganese, sodium, potassium, and other cations that form salts and are dissolved in water. High TDS values can adversely affect humans, animals, and plants. TDS is often used as a measure of salinity.

Trace element A chemical element found in small quantities (less than 1 percent) in a mineral or compound.

Turbidity The quality of opaqueness due to the presence of suspended material. It is commonly expressed in Jackson Turbidity Units (JTU). These units are roughly proportional to milligrams per liter of suspended sediment: A range in JTU of 3 to 440 corresponds to a range in concentration of suspended sediment of about 5 to 1000.

Variable A quantity that may assume any one of a set of values.

Wastewater Water that has been degraded to the extent that it cannot be recycled for further in-plant use.

Water bar (for erosion control) A small earthen berm constructed to divert and impede the flow of water over erodable soils.

Weir A dam in a waterway over which water flows, serving to regulate water level or measure flow.

ABBREVIATIONS

ac	acre
ac-ft	acre-foot
ACEC	Area of Critical Environmental Concern
ACHP	Advisory Council on Historic Preservation
AQCR	Air Quality Control Region
AUM	animal unit month
BACT	best available control technology
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
Btu	British thermal unit
CCNHP	Chaco Culture National Historical Park
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO_2	carbon dioxide
cfs	cubic feet per second
dB(A)	decibels on the A-weighted scale
EA	Environmental Assessment
EHV	extra-high voltage
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
FAA	Federal Aviation Administration
FBC	fluidized-bed combustion
FC-A-P	Four Corners-Ambrosia-Pajarito transmission line
FGD	flue gas desulfurization
FLMPA	Federal Land Policy Management Act
FS	U.S. Forest Service
ft	foot
FY	fiscal year
g	acceleration due to gravity
gal	gallon
gpd	gallons per day
gpm	gallons per minute
GWh	gigawatthour
Hg	mercury
hr	hour
ICC	Interstate Commerce Commission
ID	inside diameter
km	kilometer
kV	kilovolt
kWh	kilowatthour
l	liter
lb	pound
m	meter
MFP	Management Framework Plan
mg	milligram
$\mu g/m^3$	microgram per cubic meter
mg/l	milligram per liter
MHD	magnetohydrodynamics

mi	mile
mm	millimeter
MP	milepost
MW	megawatt
NEPA	National Environmental Policy Act
NESC	National Electric Safety Code
NIIP	Navajo Indian Irrigation Project
NM	New Mexico
NMEID	New Mexico Environmental Improvement Division
NMGS	New Mexico Generating Station
NMPSC	New Mexico Public Service Commission
NMSHD	New Mexico State Highway Department
NMSO	New Mexico State Office
NO_x	nitrogen oxides
NO_2	nitrogen dioxide
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NSPS	New Source Performance Standards
OD	outside diameter
PL	public law
PNM	Public Service Company of New Mexico
PRLA	Preference Right Lease Application
PSD	Prevention of Significant Deterioration
R	range
RARE	Roadless Area Review and Evaluation
ROW	rights-of-way
SCS	U.S. Soil Conservation Service
SHPO	State Historic Preservation Officer
SJBAP	San Juan Basin Action Plan
SO_2	sulfur dioxide
USC	U.S. Code
t	ton
T	township
t/d	tons per day
TDS	total dissolved solids
TSP	total suspended particulates
USGS	U.S. Geological Survey
WSA	Wilderness Study Area
yr	year
>	greater than
<	less than
~	approximately
μ	micro- (millionth)
°C	degree Celsius (centigrade)
°F	degree Fahrenheit
'	foot
"	inch
10^6	million (mega-)
10^9	billion (giga-)

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Appendices

Appendix A

CONSIDERATION OF ALTERNATIVES

In accordance with regulations promulgated by the Council on Environmental Quality Regulations (40 CFR 1500-1508), the Bureau of Land Management has a responsibility to "inform decision-makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment." Alternatives considered must be practical or feasible from both the technical and the economic standpoint. The no-action alternative, a case in which NMGS would not be built, and the possible consequences of it are also considered.

The no-action alternative and its consequences were considered separately from project component alternatives. Project component alternatives are those which consider routes, methods of construction, or means of environmental protection that differ from the Proposed Action. In examining the possible consequences of the no-action alternative, alternatives are defined as those which may have to be considered by the applicant if NMGS is not constructed.

POSSIBLE CONSEQUENCES OF THE NO-ACTION ALTERNATIVE

The process used to identify alternatives for analysis is summarized below and is discussed in detail in the technical report on Alternatives to the Project.

First, potential energy options were identified by reviewing a variety of sources. All specific options identified in the scoping analysis and public involvement summary were included. The options, and the source for each, are shown in Table A-1. These potential energy options were screened to ensure they were:

- In accord with national energy policy.
- Technically feasible.
- Capable of meeting a significant portion of the electric need PNM proposes to meet with NMGS. The criterion used was that an option had to be able to supply or eliminate the need for at least 5 percent of the yearly energy NMGS would supply.

The options that passed this screen are shown in Table A-2.

From these options, six potentially viable alternatives were identified as possibly being considered by the applicant if the no-action alternative is selected:

- Decentralized steam electric.
- Coal conversion plus generation.
- Geothermal plant.
- Nuclear plant.
- Out-of-state power source.
- Conservation and renewable resource alternative, including some combination of conservation, large and small hydroelectric, central-station solar-thermal electric and photovoltaic, decentralized photovoltaic, municipal solid waste, point-of-use solar heating, central-station wind, agricultural and forestry wastes, and wood-fired generation. Energy storage might be required with this alternative.

The environmental issues associated with these are discussed below.

Decentralized Steam Electric

For a decentralized coal-fired steam electric system, the local environmental effects around each plant site would be less than for NMGS since each individual power plant in the system would be smaller than

Table A-1. POTENTIAL ENERGY OPTIONS

Category	Potential Energy Option	Source					
		AWV	CEC	CPUC	PNM	Scope	Other
Coal	Central-station steam electric (NMGS)	x	x	x	x		
	Decentralized steam electric	x					
	Retrofit of existing oil/gas units	x	x		x	x	
	Coal conversion plus generation	x	x	x	x	x	
Oil/Gas	Steam turbine		x		x		
	Combustion turbine		x	x	x		
	Combined cycle		x	x	x		
Geothermal	Dry steam		x	x			
	Geopressured			x			
	Hot water		x	x	x		x
	Hot dry rock			x			
Hydro-electric	Large (>25 MW)	x	x		x	x	
	Small (including low-head)	x	x	x	x	x	x
Direct Solar	Central-station thermal-electric		x	x	x	x	x
	Solar-thermal repowering of existing units			x	x		
	Central-station photovoltaic		x	x	x	x	x
	Decentralized ("rooftop") photovoltaic		x	x	x	x	x
	Point-of-use solar heating			x		x	
	Solar-power satellite	x					
	Solar ponds	x	x				
Wind	Central-station ("windfarm")		x	x	x	x	x
	Decentralized ("backyard")		x	x		x	
Biomass	Municipal solid waste		x	x	x	x	
	Agricultural and forestry wastes		x	x	x	x	
	Wood			x		x	
	Nonwood energy crops		x	x		x	
Nuclear	Water-cooled fission reactor	x	x	x	x		x
	High-temperature gas-cooled fission				x		
	Breeder fission				x		
	Fusion				x		
Out-of-State	Purchase contract	x	x	x	x	x	
	Equity participation	x					
Non-generation	Conservation	x	x	x	x	x	x
	• Rate structure						
	• Volunteer (assistance/information)						
	• Mandatory (legislative/regulatory)						
	Load management			x	x		
	• Rate structure						
	• Direct control at point of use						
Miscel-laneous	Cogeneration		x	x	x	x	x
	Fuel cells		x	x	x		

Sources:

AWV Bureau of Land Management, "Allen-Warner Valley Energy System Environmental Impact Statement," November 1980.

CEC California Energy Commission, "Electricity Tomorrow, 1981 Final Report to the Governor and the Legislature," January 1981.

CPUC California Public Utilities Commission:
- C.E. Rixford, "Conventional Utility Supply Options," Appendix 8 to the Summary Report of the Allen-Warner Project Team, August 1980.
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PNM Public Service Company of New Mexico, "Description of the Proposed Project: New Mexico Generating Station," Revision 1, 1981.

Scope Bureau of Land Management, New Mexico State Office, "Scoping Analysis and Public Involvement, Summary for the Proposed New Mexico Generating Station Environmental Impact Statement and the San Juan Basin Action Plan Cumulative Overview," May 1981.

Other Dave Marcus, "Need for NMGS: PNM's Exercise in Deception," Southwest Research and Information Center, November 1981.

Table A-2. ENERGY ALTERNATIVES TO NMGS RETAINED AFTER SCREENING

Category	Candidate Alternative
Biomass	• Agricultural and forestry wastes • Wood
Coal	• Central-station steam electric (NMGS) • Decentralized steam electric • Coal conversion plus generation
Direct Solar	• Central-station thermal electric • Central-station photovoltaic • Decentralized photovoltaic • Point-of-use solar heating
Geothermal	• Hot water (high-temperature liquid-dominated)
Hydroelectric	• Large and small (central-station)
Nongeneration	• Conservation
Nuclear	• Water-cooled fission reactor
Out-of-State Power Source	• Purchase contract • Equity participation
Wind	• Central-station
Miscellaneous	• Fuel cells • Municipal solid waste

NMGS. However, the overall cumulative environmental loading for the whole system should be at least comparable to that for NMGS, since the total electric energy generated would be similar. In addition, each plant would require individual corridors for coal delivery, electric transmission, and possibly water supply. The required multiple corridors would be likely to have more impacts than the smaller number of corridors associated with the centralized NMGS.

The environmental effects in the vicinity of a coal conversion plus generation facility may be different from a conventional coal-fired steam electric plant. Since no full scale coal conversion plus generation facility has yet been completed, the types and extent of environmental effects of this type of facility are not yet known. The primary concern is the safe disposal of the large quantities of solid wastes that would be produced. Trace elements and trace organics in the ash or sludge might be toxic or carcinogenic. In addition, air pollution issued include the following: siting with regard to prevention of significant deterioration, nonattainment, characterizaion of discharges and control of their ecological and health impacts, and possible acid precipitation effects. Treatment of liquid waste is also an important construction issue. Construction of a coal conversion plant would probably require a large construction and operating work force than would NMGS; thus the social and economic effects on the surrounding region would be more intense.

Geothermal Power

Major environmental issues associated with geothermal power are airborne emissions, solid wastes, brine disposal, ground subsidence, water use, and hydrologic changes. Other issues include noise, chemical or thermal pollution of surface and ground waters, increased land and ecosystem disturbance (e.g., erosion, sedimentation), and short-term climate disturbances. The environmental effects are highly site-dependent.

Nuclear Power

Nuclear power plants produce radioactive isotopes that may escape into the reactor cooling system. Also, structural and other materials become radioactive during reactor operation, and liquid radioactive wastes are produced. Small quantities of short-lived radioactive gases and airborne particulates are released.

Decommissioning of a nuclear power plant must be done in a way that protects public health and safety. Spent fuel from a reactor is highly radioactive and requires shielding and permanent isolation from the human environment. The safety of nuclear power plants during an accident is a public concern. Land disturbance associated with fuel supply would be much less than for coal-fired generation.

Out-of-State Power Source

Potential out-of-state sources of electricity are likely to be either coal-fired or nuclear power plants. In the absence of unusual local situations, the environmental effects should be similar to those for plants located in New Mexico.

Conservation and Renewable Resource Alternative

This would involve use of a combination of conservation, large and small hydroelectric, central-station solar-thermal electric or photovoltaic, municipal solid waste, decentralized photovoltaic, point-of-use solar heating, central-station wind, agricultural and forestry wastes, and wood-fired generation. Hydroelectric environmental issues include passage of fish around dams, water level fluctuations and downstream flow changes, water quality, and dredging. The reservoir behind a dam would destroy the resouces, ecosystems, and human uses of land in the area inundated. Central-station solar systems required large land areas with potential for land use conflicts and disturbance of local ecosystems. Central-station wind plant issues include safety, electromagnetic interference, noise, asethetic, and land use problems. Agricultural and forestry waste environmental issues include erosion due to removal of wastes that would otherwise hold the soil in place, airborne pollutants, and waste disposal. Environmental issues associated with wood-fired generation are similar to those for agricultural and forestry wastes. Environmental issues associated with

photovoltaic, and point-of-use solar heating are minor.

ALTERNATIVES TO PROJECT COMPONENTS

Alternatives eliminated from detailed analysis and the basis for ther elimination are discussed below.

Coal Supply

Coal from outside the San Juan Basin would cost significantly more to deliver to the proposed plant site than San Juan Basin coal because of mining and transportation costs.

NO_x Control

Low-NO_x Burner/Furnace Design and Flue Gas Treatment for NO_x Control. These options were not considered for detailed analysis because they are in an early development stage and are technically unproven.

Solid Waste Disposal

Marketing of Fly Ash for Commercial Products. At the present time, it is not known whether a commercial market might develop, where it would be located, or how the fly ash would be transported to the market.

Random Dumping of Fly Ash and Scrubber By-Products. This alternative was eliminated because the fly ash and scrubber by-products would be dispersed throughout mine overburden and would therefore be inaccessible for resource recovery or mitigation of potential impacts.

Off-Site or On-Site Landfill. In addition to excessive cost, there would not be a sufficiently suitable area within the plant site boundaries, and other lands outside the potential coal mine areas are not available to the applicant.

Heat Rejection System

Once-Through cooling. The large amounts of water required and the capital and operating costs for necessary facilities would not be economically reasonable.

Cooling Ponds. Larger land areas would be required, larger water losses due to evaporation would occur, surface and subsurface hydrology could be affected by seepage, suitable geologic formations for impoundment are unavailable, and costs would be significantly greater than for other available cooling systems.

Natural-Draft Cooling Towers. This sytem would not be technically feasible because the high temperature and low humidity of ambient air would not create the necessary natural draft effect, towers (up to 600 feet) and plumes would be highly visible, and capital costs would be high.

Dry Mechanical-Draft Towers. Overall plant efficiency would be reduced because turbines must operate against high condenser back pressure. Installed costs for dry mechanical-draft cooling towers could be as much as 20 times the cost of wet mechanical-draft cooling towers. Land area requirements for dry mechanical-draft cooling towers would be greater than for wet mechanical-draft cooling towers.

Water Supply System

Uranium Mine Dewatering. Reasons for elimination of this potential water source include:

- Availability of water would be uncertain because of current inactivity in the uranium industry.
- Production would not be within the control of the applicant.
- Policies with respect to rights and uses for such water are in an emergent stage.

Appendix B

DETAILED DESCRIPTION OF SYSTEMS, FACILITIES, AND PROCEDURES

The following summary descriptions are from the Project Description Technical Report.

PLANT FACILITIES

Power Plant Construction Sequence

There would be no clear demarcation in the sequence between one group of plant construction activities and another. It is expected that about 60 months would elapse from the time site clearing started in 1985 until the first generating unit was ready for commercial operation. The total construction time required for all four units would be approximately 13 years (1985-1998).

Station Layout and Site Preparation

The proposed arrangement of power plant facilities is shown on Figure 1-2 in NMGS Chapter 1. Most of the structures would be enclosed by corrugated metal panels, painted rawhide color with buckskin-colored trim. Exposed structural steel surrounding the boiler structure, particulate removal system, and sulfur dioxide (SO_2) removal system would be painted the same rawhide color. Exposed paint-receptive surfaces of storage tanks, coal-handling conveyors, cooling towers, and plant support structures would be finished to match the main power block. The main power block would consist of four units, each arranged in a series of rectangular buildings varying in height from approximately 100 feet at the turbine generator area to approximately 240 feet in the boiler area. The chimney stacks may be as high as 575 feet. From south to north, each generating unit would include the turbine generator area, coal pulverizer area, boiler area, particulate removal system, SO_2 removal system, and chimney stack.

Preliminary plans would be to stepgrade the plant area and preserve existing contours to the maximum practical extent to avoid excessive cut-and-fill operations. During construction, erosion control would consist of drainage ditches across disturbed areas that would tie into the existing surface drainage features. Siltation control measures would include sedimentation ponds, sediment traps, and controlled drainage slopes. Plant construction laydown areas would be located within a 1-mile radius of the plant.

All spoil (material unacceptable for structural fill) would be hauled to onsite areas not required for the plant, spread to blend with the natural topography, and shaped to control erosion from drainage. Topsoil would be removed and stockpiled by construction equipment prior to required excavations. The piles would be shaped and graded for drainage and erosion control. Topsoil would be reused in revegetating spoil disposal and disturbed areas.

Water sprayed from tank trucks would be used as a dust suppressant on unpaved roads during construction. Some roads would not be paved until near the end of major construction phases in order to prevent unnecessary damage to pavement from the construction operations. All disturbed nonroad areas not covered with asphalt, concrete, or gravel would be reseeded with native grasses or shrubs for erosion and dust control.

The entire site would be fenced at the beginning of construction to provide adequate security for contractors' equipment, plant materials and equipment, and overall station security requirements.

Steam Electric System

The Proposed Action is to purchase and install conventional turbine generators as produced by any of several manufacturers. The turbine generators would have a nominal rating of 500 MW. They would be capable of providing a gross output of about 550 MW, with about 50 MW required for the plant operations.

Fuel Supply System

Identification of Primary and Secondary Fuels. The NMGS would require two types of fuel for efficient, reliable operation: the proposed primary fuel would be San Juan Basin subbituminous coal; residual fuel oil produced in New Mexico is the expected secondary fuel. The choice of a secondary fuel would be based on economics (including costs for environmental compliance) and availability. Subbituminous coal would be used in the steam generation system supplying steam to the turbine generator and plant ancillary systems. Residual fuel oil would be used to produce steam for the plant auxiliary steam system during plant startup and maintenance intervals. Diesel fuel oil (No. 2) is expected to be used only as a fuel for the emergency diesel generators. Auxiliary steam would provide station heating, deaerator pegging steam, steam coil air heater requirements, main steam generator ignitor oil supply, and condenser air ejectors.

Fuel Consumption and Supply. NMGS coal consumption for four 500-MW units (assuming coal heat content of 8300 Btu/lb) would average about 7.5 million tons per year and 300 million tons over a 40-year plant life, based on project estimates for station heat rate, gross output, and average unit capacity factors (65 percent) over the life of the station. Annual and total fuel oil consumption would be a function of the the number of units on-line and boiler design. Average annual fuel consumption with four units on-line would be approximately 180,000 barrels of oil. Total fuel oil consumption over the life of the plant would be approximately 7.2 million barrels. Fuel oil supplies have not yet been contracted; delivery would probably be by truck or tank car.

Secondary fuel would be stored in tanks at the site and would be loaded from truck or train unloading stations. Unloading stations would be designed to collect any inadvertent oil spills in sumps. Spilled oil would be transferred to holding tanks for oily wastes, which would be included in the water management system. These wastes would be trucked off-site to a contracted disposal firm for final disposition.

Diesel fuel would be used during station construction for on-site equipment and transportation at the rate of approximately 250,000 gallons per year (gal/yr). It would not be used as a boiler startup fuel. Gasoline would be consumed in normal vehicle use during station construction at the rate of approximately 25,000 gal/yr. All diesel fuel and gasoline for construction equipment would be stored on the site in elevated or buried storage tanks. Off-site fuel use would be dependent on sources and methods of transportation to the site and is currently undetermined.

Fugitive Dust Control

Fugitive dust emissions from conveyors, crushers, and other coal processing areas would be controlled using proven techniques. The estimated fugitive emissions and emission control effectiveness for the various coal-handling and processing steps are summarized in the Air Quality Technical Report.

Emission Control Systems

All emission control systems would be designed to meet applicable federal and state regulations. Details of these systems can be found in the Project Description Technical Report.

Particulate Removal System. Two particulate control systems were evaluated for use at the proposed NMGS (i.e., fabric filter; electro-static precipitator, both hot-side and cold-side types). These two systems were selected for detailed analysis because they would be capable of removing particulate matter at high efficiencies and would meet applicable federal and state regulations for particulates. Fly ash would be collected in hoppers with a design storage capacity that would prevent ash from reducing the efficiency of the particulate removal system, regardless of the system chosen.

Sulfur Dioxide Removal System. The two SO_2 control systems selected for detailed analysis (i.e., wet limestone scrubbing; alkali spray-drying) would be designed to achieve a peak SO_2 removal efficiency of 85 percent, based on the worst-case Bisti coal analysis. These SO_2 control systems would be capable of consistently attaining an average SO removal efficiency of 80 percent, if required to meet New Mexico state emission limits.

Nitrogen Oxides Control System. Any one of three alternative control techniques is capable of meeting the current New Mexico NO_x standards (dual-register burner; tangentially fired steam generator; controlled-flow/split flame burner). Total NO_x emissions would be 35,000 tons per year, assuming that minimum New Mexico NO_x standards are met.

Stacks

The stack height for each NMGS unit would be in the range of 400 to 575 feet. These heights are based on EPA's draft of the proposed revisions to 40 CFR, Part 51, to implement Section 123 of the 1977 Clean Air Act Amendments. The nearly level topography in the plant vicinity would not cause downwash problems. The stack exit diameter would be approximately 30 feet. Construction materials would probably be concrete with brick lining. One stack would be required for each of the four units. The planned distance between stacks is about 400 feet. The stack lighting system would conform to FAA requirements.

Other Emissions

The primary function of the auxiliary boiler would be to provide steam during plant startup operations. The boiler would probably be used twice a year for 2- to 4-week periods during scheduled maintenance. For the rest of the year, auxiliary steam would be supplied from the main unit boilers. The auxiliary boiler would comply with federal and state emission limitations for auxiliary boilers fired with No. 6 fuel oil; it would consume approximately 5350 lb/hr. Preliminary estimates of fuel oil consumption after startup total approximately 2.2 million gal/yr for each 500-MW unit.

A diesel generator would be required to supply electric power in an emergency. The unit size would probably be between 800 and 1000 kW. The unit would run on diesel oil supplied from the unit's day tank.

Disposal of Plant-Generated Wastes

Construction and operation of the NMGS would result in the production of several kinds of solid and liquid wastes. The wastes and their characteristics can be only broadly categorized at this time; detailed descriptions must await final project design. An important objective in the design of the NMGS is that there would be no transport of wastewater beyond the boundaries of the waste disposal facilities (zero discharge). If a zero discharge system cannot be maintained, NPDES permits would be obtained to allow discharge of effluents beyond plant boundaries. All solid and liquid waste disposal facilities would be in the general vicinity of the plant. Mined-out pits from the coal mining operation would be used for solid waste disposal to the maximum practical extent.

Water Management and Water Treatment

The applicant plans that the water management system would operate, under nonupset conditions, without discharge to any off-site channel or receiving water body, and without significant percolation or seepage to ground water. An NPDES discharge permit would be applied for if required. The NMGS water management system would be designed and operated to reuse, reclaim, and recycle water to the maximum practical extent, including reuse in progressively less demanding parts of the system. Several water treatment systems and processes would be incorporated in the water management system to provide water of acceptable quality for the various in-plant needs. Used water, degraded to the extent that it could not be economically treated for further in-plant use, would be used for transport and disposal of plant-generated wastes or would be discharged into evaporation ponds (Water Quality Technical Report).

Flow in the several intermittent drainage channels that presently cross the plant site boundaries would be diverted around the plant area; thus the

runoff would not be affected by plant activities or emissions. The plant site area would be graded, shaped, and surfaced to facilitate control and collection of contaminated runoff from on-site precipitation from a 10-year 24-hour storm and possible liquid spills. Spills and plant site runoff that may be contaminated would be collected in drainage basins; noncontaminated runoff would not be collected.

The major plant water use would be in the heat rejection system, which would discharge large volumes of water into the atmosphere by evaporation from the cooling towers. Makeup water for this system, from either the San Juan River source or ground water, would be treated by lime or lime-soda softening and pH adjustment to control scaling and corrosion before introduction into the system. In addition, the water in the system probably would be chlorinated or ozonated as required to control biological fouling of the tower and algae growths in the basins beneath the towers. Blowdown from the system would be used in the plant flue gas desulfurization system and for ash transport or wetting.

The water treatment processes would yield several waste products, including sludges and concentrated solutions. These wastes would be used for wetting fly ash and then disposed of in the mine. Liquid wastes unsuitable for placement in the mine with ash would be disposed of in on-site evaporation ponds.

Solid Waste Disposal

Four types of wastes would be derived from coal used in NMGS: bottom ash, fly ash (including economizer ash), coal pulverizer rejects, and flue gas desulfurization (FGD) byproduct. Bottom ash and pulverizer rejects would be combined when removed from the system. The FGD byproduct could be either dry particulate matter or a water-based slurry, depending on the selected desulfurization process. If the FGD by-product were in particulate form, it would be removed from the flue gas in combination with the fly ash; in slurry form, it would be removed separately from the fly ash.

On a quantitative basis, the most significant wastes associated with NMGS would result from the coal burning process, including coal preparation (pulverizing) and desulfurization of the combustion gases. On a volumetric basis, the estimated average production of coal-derived wastes would be about 1475 acre-feet per year with four units operating, or 59,000 acre-feet over a 40-year plant life. Other project-related wastes would be derived from the various water treatment processes required for operations; sanitary wastes derived from support of the project construction, operating, and maintenance staffs; and plant construction wastes.

Ash Disposal.

Fly Ash and Scrubber By-Product. The Proposed Action includes combining fly ash with FGD by-product prior to disposal. If a wet limestone FGD process were selected, the slurry from the FGD system would be dewatered before being mechanically mixed with fly ash. If an alkali spray-drying FGD process were selected, fly ash and FGD by-products would be collected simultaneously in the particulate control system and the combined material would be wetted in a mechanical mixer.

The wet material would be hauled by end-dump truck to previously mined portions of the coal mine. Disposal areas would be prepared for receiving ash by first backfilling with mine overburden material to a depth of 20 to 60 feet, depending on the volume of overburden requiring disposal. Present expectations are that several layers of ash would be placed, to an ultimate thickness of 40 to 60 feet. After the ash was placed and spread to the final disposal depth, it would be covered with random overburden from the mining operations to a depth of 4 to 8 feet and approximately 12 inches of select overburden (top dressing). The final surface of the disposal area would be shaped and gently sloped to permit drainage without erosion. Reclamation of disposal areas would consist of establishing a vegetative cover in accordance with reclamation requirements that would be specified by the Office of Surface Mining for individual mining plans. Revegetation would be accomplished by seeding, with selected native species, at the appropriate season and irrigating or reseeding as required until a satisfactory ground cover was established. Although the quantity of water to be used for

irrigation cannot be specified at this time, it could be substantial.

The Proposed Action would result in the fly ash being concentrated within relatively small areas and not mixed with materials other than the FGD by-product. Therefore future recovery of the material might be feasible if economic conditions made it worthwhile for resource recovery, or if for any reason environmental effects of the disposal were no longer satisfactory.

Bottom Ash and Pulverizer Reject Disposal. A dewatered slurry of bottom ash and pulverizer rejects would be discharged into end-dump trucks for hauling to the disposal area. Disposal would be into previously mined portions of the coal mine, probably contiguous to the fly ash disposal areas. The procedures for disposal would be the same as described above for fly ash, in case at some time it was necessary or desirable to have access to the materials.

Sanitary Waste

The sanitary sewage treatment system would consist of two treatment plants capable of handling the waste of an aggregate population of 1000 individuals. One sewage treatment plant would be constructed for Units 1 and 2, and a second plant would be installed when Units 3 and 4 are constructed. Each sewage plant would be sized to handle an estimated 30,000 gallons per day.

The effluent from sewage treatment would be delivered to the water management system for reuse within the generating complex. During the construction period, portable chemical toilets would provide sanitary facilities for the construction labor force.

WATER SUPPLY SYSTEM

Water Supply Pipelines

Prior to initiating construction-related activities, the ROW would be acquired from private landowners. Owners and tenants of private land and lessees and developers of public lands near the ROW would be notified in advance of construction activities that could affect their property, business, or operations. A preconstruction plan (Plan of Operation) would be developed for BLM lands.

Construction, operation, and maintenance of the following proposed main wawater pipelines project components were considered in the environmental analysis. Map 1-1 in NMGS Chapter 1 shows the general location of the proposed main water pipelines. The proposed main water pipelines would consist of the following six elements:

- One electric-motor-driven pumping plant (manned) at the intake site with an ultimate capacity of about 35,000 acre-feet of water per year.
- Approximately 1 mile of 48-inch outside diameter (OD) main water pipeline (steel) from the intake pumping plant to the first booster pump station.
- Initially, approximately 39 miles of 42-inch outside diameter (OD) main water pipeline, between the first booster pump station and the terminal storage reservoir near NMGS.
- Three automatic electric-motor-driven pump stations (unmanned) between the intake pumping plant and the pipeline high point near Moncisco Mesa.
- Approximately 20 blowoff valves installed along each of the proposed main water pipelines to discharge sediment that might collect at low points during certain flow conditions and to drain the lines for inspection or repair.
- Cathodic equipment as required to protect existing or future oil and gas lines in the vicinities of the intake pumping plant and booster pump stations.

New access roads are not proposed for construction or operation of the main water pipelines and associated facilities. Existing roads would be improved where continuous access is required, such as to the intake pumping plant. Existing roads (e.g., new and old NM 371) or the pipeline ROW would be used for surface travel. Roads used would be maintained during and rehabilitated after construction.

Construction Methods. The applicant proposes to acquire approximately 35 acres on the floodplain of the San Juan River for siting of the intake pumping plant and river diversion facilities. Construction of the intake pumping plant

would require excavation to as much as 20 feet below the existing ground level. Excavated materials would probably be hauled by truck to a convenient on-site stockpile area or be used for construction of a protective dike. After all four pump units were constructed, the dimensions of the intake pumping plant would be 48 feet by 130 feet. The plant site would be surrounded by a dike, or the entire site area would be filled and raised above the 100-year flood level, prior to construction of the intake pumping plant.

Pipeline construction activities would normally be confined to a 90-foot ROW. Only that portion of the ROW needed for construction would be cleared. Typical construction activities require clearing aboveground vegetation and obstacles from an average 30-foot width of the ROW to allow safe and efficient operation of the construction equipment. Blading of the ROW would not be done unless necessary for the movement of machinery and equipment or for the ditching required for the installation of pipe (for instance, it is sometimes necessary to blade in areas with steep side slopes). In some areas of rough terrain, a 60-foot ROW clearance would be the minimum necessary for safe and efficient construction. Due to terrain or proximity of existing utilities, there would be some areas for which more than 90 feet would be needed, but in no instance would temporary use of more than 120 feet be required. In these cases, it is possible that a temporary use permit would be needed for as much as a 120-foot construction ROW.

To permit safe vehicle operation, it may be necessary to con-struct temporary bridges or culverts across washes and arroyos on the working side of the ROW. No major rivers or perennial streams would be crossed by the proposed main water pipelines. Wash and arroyo crossing points would be carefully selected to reduce disturbance of wash beds and arroyo banks.

Temporary storage areas required during pipeline construction for equipment, pipe, and other materials would be acquired through private permission or temporary use permits. Generally, these areas would not be on or adjacent to the ROW. Where fences were encountered along the ROW, adequate bracing would be installed at each edge of the ROW prior to cutting the wires and installing temporary gates, whose opening would be controlled.

Once the ROW had been prepared, stringing, welding, and trenching operations would begin. A trench, no more than 15 feet wide and approximately 10 feet deep, would be centered on a line about 30 feet from one edge of the ROW. Construction activities would proceed with special precautions to prevent damage to buried utilities. Generally, trenching operations would employ backhoes or draglines; however, subsurface conditions may require different types of excavating equipment. Blasting would be used only when necessary. Normally, the effects of the blasting would be confined to the ROW. Where blasting was necessary, all required safety precautions would be taken.

Generally, intermittent watercourses (washes/arroyos) would not be crossed during periods of periodic high flow (e.g., late summer). Construction of crossings would generally be accomplished within 14 days. Streambed reconstruction would be consistent with Corps of Engineers requirements for 404 permits (33 USC 1344). Every effort would be made to minimize the potential effects of construction on water flow. The stream gradient would be restored upon completion of construction, stream banks would be restored to resemble their original grade, and breakers or riprap would be placed over the pipeline along banks where necessary for erosion control.

Crossings of NM 371 would be done by open trench methods, unless final design studies show that tunneling under the highway by jacking casing pipe is feasible. If pipeline construction was by open trench, both the initial and second main water pipelines would be installed under the highway during initial construction. Unimproved roads would be trenched and restored.

Stringing, trenching, lowering, joining, grouting, backfilling, and cleanup are the main steps that would follow ROW preparation. The pipe would be strung along the ROW prior to or during trenching operations. A temporary pipeline laid on the surface near the ROW boundary would be used to convey about 5 acre-feet of water along the work site for

construction use. Water would be pumped from the San Juan River, one of the irrigation canals crossed, and nearby wells as appropriate. Existing livestock water ponds would be used for storing water from the construction water line through arrangements made with the owners for such use. The water would be used for purposes such as dust suppression on roads, conditioning materials for compacted or consolidated backfill, and hydrostatic testing of the pipeline.

The three proposed intermediate pump stations would be essentially identical (except for power ratings, etc.). The main water pipeline and ROW would be shifted away from the highway on each end of the intermediate pump station sites to enable these sites to abut the highway. During construction, 2 additional acres of land outside of the permanent ROW would be temporarily required for office, tool, and equipment storage areas.

Materials from trench excavation, particularly the dune sand, between MP 3.5 and 30.5 of the proposed main water pipeline, would be suitable for all backfill requirements of pipeline construction. Materials for backfill around structures and for embankment work at the intake works and pumping plant would come from excavation required for the structures and from a proposed borrow area downstream of and adjacent to the proposed intake plant site. Materials for use in concrete manufacture would come from commercial sources in the Farmington area.

Completed construction areas (including the ROW) and access roads no longer required would be returned as nearly as practicable to original condition or to that agreed upon by the applicant and the landowners or the authorized officer. Restoration of areas disturbed by intake pumping plant, pipeline, and intermediate pump station construction would be accomplished by whatever means is most suitable for the soils, terrain, climatic conditions, and surrounding vegetation.

Erosion control, as necessary, would be employed on sloping areas (>4 percent slope) along the main water pipeline ROW and along any cuts made through unconsolidated materials. All reasonable means would be undertaken to control erosion and soil damage resulting from construction, rehabilitation, or maintenance and operation, including (but not limited to) construction of terraces, water bars, or other structures. During routine aerial reconnaissance, the applicant would monitor the success of erosion control and revegetation in accordance with the BLM monitoring plan, which would be a condition of the ROW grant.

Special Construction Practices. The applicant would undertake a number of construction and restoration practices in addition to those already mentioned. The resource considerations outlined below are intended to reduce environmental impacts. These practices would be incorporated as stipulations to a ROW grant.

During construction, operation, maintenance, and termination of the project, the applicant would perform all activities in accordance with applicable air and water quality standards, related facility siting standards, and related plans for implementation. Pesticides would not be used during construction or operation of these pipelines. An EPA-approved herbicide would be used within the fences at the pump stations to prevent weed fires, and around safety signs within the ROW so they remain visible. Adequate warning signs would be positioned far enough ahead of construction zones so that drivers would have sufficient warning to decelerate safely. Signs would be positioned in accordance with relevant regulations.

Construction of the proposed main water pipeline may occur during months when recreation use is high. The work force would not use public campgrounds for temporary housing.

Prior to initiating any ground disturbance, the applicant would take actions to protect cultural resources in accordance with agreements currently being developed between the BLM, the Advisory Council on Historic Preservation, and the State Historic Preservation Officer in New Mexico. The applicant would make a concerted effort to protect the scenic values in the area of construction and the adjacent land. For example, all aboveground improvements and barricades would be nonreflective. When a safety color is not required, the color used would be chosen to blend with the natural background for that location. The proposed main water pipelines would not be located within a Wilderness Study Area

(or RARE II Area) boundary and would not come closer to a boundary than an already existing road or trail. Where the ROW includes public lands on which cadastral survey monuments and markers are located, the applicant would avoid disturbance or removal of such monuments and markers. If the removal of monuments or markers becomes necessary during specific construction activities, the applicant would advise the appropriate agency of that need. Removal and relocation would then be done in accordance with detailed instructions set forth by the appropriate agency.

The applicant would perform, at its own expense, any required monitoring, modifications, or additional reclamation work needed to comply with the terms and conditions of the ROW grant.

Operation and Maintenance. The applicant would conduct aerial patrols to inspect the ROW at least every 2 weeks to determine the integrity of the pipeline and the success of surface-disturbance mitigation measures. Surface traffic would be limited to periodic valve inspections, ROW maintenance, and emergency pipeline repairs. The intermediate pump stations would be inspected daily by a two-person crew from NMGS. The pipeline pressures, pump performances, and status information of the system would be telecommunicated from the booster plants to the intake plant and would be monitored and recorded by instruments and supervisory personnel 24 hours per day.

Reservoir

Preliminary planning indicates that the active storage capacity of the reservoir should be about 4000 acre-feet. This quantity would be adequate for supplying the power plant needs for approximately 5 weeks at ultimate development (four 500-MW units). A gross capacity of about 5000 acre-feet would be provided to allow for sediment deposition in the reservoir and dead storage below the minimum reservoir operating level. The full reservoir water level would be approximately elevation 6135 feet; the minimum operating level would be about elevation 6100 feet. The reservoir would be sufficiently higher in elevation than the power plant so that the power plant could be supplied by gravity flow throughout the full range of reservoir operating conditions. The water surface area of the reservoir, when full, would be approximately 145 acres.

The reservoir design and operation would be essentially the same whether the project water supply was obtained from the San Juan River or a well field located in the power plant vicinity, or a combination of those sources. Because there may be suspended solids in the water, particularly if the supply is from the San Juan River, present plans are to provide separate pipelines to deliver water to the reservoir and to transfer water from the reservoir to the power plant. The reservoir inlet and outlet structures would be separated from each other to the maximum practical extent, to facilitate sediment deposition in the reservoir. The reservoir would be contained by a dike, or embankment, extending about 70 percent around the reservoir perimeter. To the maximum practical extent, the embankment would be constructed using materials available within the reservoir area. A program would be implemented to establish a vegetative cover on the exterior slope of the embankment. A fence would be erected around the entire perimeter of the reservoir. Access to the reservoir would be provided from the new NM 371, which would cross the extreme northeastern corner of the section in which the reservoir would be constructed (see Map 1-3 in NMGS Chapter 1).

Special materials that may be needed in constructing the embank-ment would come from outside sources. The types of special materials and their potential sources would be determined during design of the project. Borrow area(s) outside the reservoir, if required, would be prepared by first removing and stockpiling topsoil. After materials for construction were removed, these borrow area(s) would be graded to satisfactory, stable slopes with proper drainage and would be revegetated. The BLM and local agencies would be consulted to formulate restoration plans.

TRANSMISSION SYSTEM

NMGS Switching Station

The northern terminus of the 500-kV line from NMGS to Rio Puerco Station would be provided by the proposed 500-kV

switching station located about a quarter mile south of NMGS. The switching station would be developed in four phases. The station would be constructed of structural steel, with a maximum tower height of 120 feet. Most of the station would be less than 45 feet in height. The site would be a rectangle approximately 800 by 2200 feet (40.3 acres) and would be surrounded by an 8-foot chain-link fence topped by three strands of barbed wire. Access to the switching station would be from either NM 371 or the Star Lake railroad. A new microwave station would be established at the NMGS switching station.

Rio Puerco Station

The proposed Rio Puerco Station would provide the southeastern terminus of the proposed 500-kV lines. The proposed station (approximately 10 miles northwest of Rio Rancho, New Mexico) would be situated directly northwest of the WW-BA 345-kV tap.

The maximum tower height would be 120 feet, but most of the station would be less than 45 feet in height. Additional descriptions for general visual characteristics are presented in the Visual Resources Technical Report. The site would be a rectangle 2045 by 2325 feet (109.2 acres), with 45.7 acres enclosed by an 8-foot chain-link fence and topped by three strands of barbed wire. Access would be from Rio Rancho, over approximately 10 miles of existing road (20 feet wide), which would be improved by grading.

Existing access to the site is excellent. The graded roads of the Rio Rancho development would require only slight improvements. This site is located adjacent to all of the 345-kV lines that would be connected to the station. Hence, no 345-kV construction would be required. Incremental 500-kV transmission line length would be 8.4 miles. These 500-kV lines would probably be within existing corridors.

Construction Procedures

Rights-of-Way. The ROW width for the 500-kV transmission lines would be 200 feet, which would allow the use of long-span construction and provide some flexibility for structure alignment. This width would ensure that midspan conductor blowout from high winds would not exceed the ROW. Clearances to any existing buildings or structures would be provided in accordance with the National Electric Safety Code (1977 edition).

Construction of transmission lines would generally follow a sequence of ROW clearing, road construction, tower foundation construction, tower assembly and erection, conductor and shield wire stringing and tensioning, and finally, site restoration. However, prior to the actual start of construction procedures, extensive aerial photography and on-the-ground survey work would be completed. The survey work and those operations involved in the typical construction sequence are discussed below. It should be noted that, within the limits set by the applicant, the final choice of exact procedures would be that of the contractor selected by the applicant to construct the transmission line, though the applicant would meet all landowner/ manager restrictions and stipulations.

Large and bulky materials would most likely be delivered by rail. Two or three marshalling yards near the railheads would be required during construction of the project. Staging areas for temporary material and equipment storage would be located about every 30 miles along the transmission line route. Materials would probably be delivered to the construction site by truck.

Construction activities at stream crossings would be planned and supervised by the construction contractor and the applicant's engineering staff on a site-by-site basis, to ensure minimal modification of channel hydraulics and minimal introduction of sediment and contaminants to stream channels. Various types of equipment would be used during construction of the line.

Survey Procedures. The line survey would be accomplished by a combination of ground survey and aerial photography. The ground survey team would establish a basic control network by locating photo-identifiable points on the ground at selected points along the route. Points of intersection, coordinate locations, and the corridor centerline would be determined by the ground survey team.

Boundary and easement identities would be determined from a combination of ground survey and aerial photographs.

Soil Borings. Soil borings would be made at approximately half-mile intervals, or where there are significant changes in the geology, to determine the engineering properties of the soil.

Clearing. The clearing of some natural vegetation would be required; however, selective clearing would be done only when necessary to provide electrical clearance, line reliability, and construction and maintenance operations. Clearing crews would make a minimal number of passes through the ROW, making use of existing access roads as much as possible. Existing cleared areas would be used whenever possible for construction areas, storage areas, etc. Grading and removal of grass cover or low growth would be prohibited unless considered necessary.

Large trees encountered under or near conductors would be topped or removed. This would be done to provide adequate electrical clearance under the lines according to National Electric Safety Code standards, and to improve line reliability by removal of trees that could possibly fall on the line (whether they were in or outside the ROW).

Access Road Construction. The construction of access roads would be required to allow the movement of the various sizes and types of vehicles required for construction of the line. Access roads would be temporary, unpaved construction roads along the ROW, permitting access for workers, materials, and equipment to the ROW (sometimes with approved deviations away from the ROW). Access roads would be closed to public travel and restoration measures applied once construction is completed. Roads with a maximum grade of 7 to 10 percent are desired for safe and efficient construction. Existing roads would be used for construction access when possible. Where necessary, roadside drainage ditches and water bars would be installed to control erosion. Where fences are encountered crossing the route of a temporary road, a temporary gate would be installed, which can be removed at the completion of the project and the fence permanently closed.

The total amount of new access roads required for construction of the proposed facilities is dependent on the ROW surveys. Only after the surveys are completed and exact line alignment and structure sites are located can the number and extent of new access roads be precisely determined. As a result, worst case assumptions were made for the analysis of impacts from new access roads.

Tower Construction, Assembly, and Erection. It is expected that circular cast in-place concrete foundations would be the predominant type for the tower center support; however, other types may be used in certain cases. At locations where the circular concrete foundations could not be installed because of underlying rock formations, rock bolts or rock anchors would be considered. Construction of the foundations for the self-supporting angle structures would be very similar to the construction of the foundation for the center support of the guyed-vee structure. An area approximately 150 by 200 feet would be required at each tower site to provide space for the actual tower installation as well as an assembly and construction area for foundations, anchors, and tower components.

Concrete from existing commercial plants would be delivered in transit-mix trucks to the tower site when possible and economically desirable. In remote areas, the concrete would be supplied from temporary batch plants located at approximately 20-mile intervals (i.e., five batch plants for the proposed and alternative routes). An area of about 2 acres would be required to store cement, gravel, sand, and water and to operate the portable plant.

Ten- to 30-acre marshalling yards for receiving and disbursing materials would be secured adjacent to railroad and major transportation facilities in the Albuquerque area. Smaller staging areas, approximately 5 to 10 acres, would be located about every 30 miles (i.e., three marshalling yards per line) along the ROW to store material and equipment as construction progresses. The lattice tower

members would be bundled by tower units at the marshalling yard and transported by truck to the tower sites.

Grounding. The potential of induced voltages from structures to earth would be maintained at a low value by the installation of a grounding system. The steel structure would be grounded by means of a grounding wire attached to the stub angle, routed below grade, and connected to a grounding rod adjacent to the foundation. A grounding plate buried at the bottom of the foundation excavation may be used as an alternative to the ground rod. In areas where ground rods or plates cannot be installed, a counterpoise would be installed. The application of magnesium sulfate, copper sulfate, sodium chloride, or other chemicals to decrease soil resistivity would be considered only when other grounding methods prove ineffective. Metal fences, gates, buildings, and roofs (on or directly adjacent to the ROW) would be grounded to eliminate possible shock hazard caused by induced voltages.

Conductor Installation. The conductor type and size would be determined from economic and performance studies. Vee-string insulator assemblies with 24 to 26 units in each leg would be used to support the conductor at the tangent towers. Individual lengths of conductor or shield wire would be strung in opposite directions and compression-spliced together to provide approximate 3-mile lengths, which can be tensioned simultaneously. The total disturbed area at a pulling and tensioning site would be about 200 by 50 feet, although no clearing or leveling would be required outside the 20- by 40-foot areas unless vegetation and terrain make it necessary for safety and efficiency.

Shield Wire Installation. Two shield wires would be installed above the three-phase conductor bundles for lightning protection and would be positioned to provide a shielding angle of approximately 10 degrees with respect to the outside phases. Shield wires would be installed in the same manner and at the same time as the conductors.

Cleanup and Site Restoration. Normal cleanup at each site during construction would eliminate most cleanup efforts during the final phase. All waste and scrap materials would be removed from the ROW and deposited in local landfills in compliance with local regulations and in accordance with land owner or manager agreements.

Lands disturbed by heavy equipment or trucks would be restored; deep ruts and holes would be eliminated by filling or grading. Disturbed areas around structure foundations would be graded to approximate the original grade. Any damage to existing bridges, culverts, driveways, or roadways during construction would be repaired by the contractor. Temporary bridges and culverts would be removed from temporary access roads, and the roads would be restored to their natural state by grading original slopes and planting natural cover. Temporary construction roads would be harrowed and reseeded as required, or allowed to return to an original state as specified by the land owner or manager. Soil removed during construction would be replaced, graded, and reseeded to approximate the original conditions.

Maintenance

The applicant would keep the transmission line ROW closed and would patrol the transmission line by helicopter each month. An annual ground patrol would be conducted by a four-wheel-drive vehicle, or by foot where necessary. Should it become necessary to reach a structure for maintenance (such as tightening loose hardware, replacing damaged members, or replacing broken insulators), that structure would be reached either by helicopter or overland from existing access roads. Depending on the maintenance requirements, it may be necessary to use a high-reach line truck and several pickup trucks. If any maintenance required access to a structure on public lands, the appropriate agency would be notified in advance, except for emergencies requiring immediate repair.

Transmission System Cost

The total cost of the proposed 500-kV transmission line can only be estimated by the applicant at this time. Surveying and engineering studies are required to determine the exact centerline and tower locations. Once this is accomplished, accurate costs can be identified.

For the purposes of this EIS, preliminary construction and ROW cost estimates are available and have been used. The total estimated cost of the transmission project is $256,618,458. This estimate includes the following components: first transmission line, $78,775,216; second transmission line, $104,684,401; NMGS switching station, $43,178,965; Rio Puerco Station, $23,338,537; and NMGS-FC-A 500-kV loop, $6,641,339. All of these estimated costs reflect a projected inflation rate of 7 percent calculated through the year of expected completion of each project component.

Appendix C

DESCRIPTION OF BASELINES 1 AND 2

The New Mexico Generating Station is proposed to begin construction in 1985 with the construction period for the four units continuing through 1998. Operation of Unit 1 would begin in 1990. In order to conduct the impact assessment based on a description of the affected environment as it would be during these future times, baseline conditions were estimated into the future. Projects and programs that have a high likelihood of existing in the affected environment by the times of construction and operation of NMGS were identified by the following categories:

- Exist now and will continue
- Are under development
- Are licensed but not under construction (as of September 1, 1981)
- Are under development but not fully licensed
- Are formally proposed and undergoing environmental review

San Juan Basin Action Plan proposals were considered in the cumulative impact assessment, as discussed in Chapter 3.0 and the Cumulative Overview document.

Projects and programs to be included in Baselines 1 and 2 were identified during the scoping process and through subsequent contacts with agency and industry representatives. Baseline 1 consists of projects or programs that exist and are expected to continue, and those that are approved. Baseline 2 consists of Baseline 1 plus projects that are formally applied for and undergoing some phase of permitting process and have a high likelihood of existing during construction or operation of the proposed NMGS project.

Each impact assessment technical report identifies differences in analysis results based on the two baselines or any adaptation of these baselines to a particular analysis. In general, differences in results based on the two baselines were minor.

Tables C-1 through C-6 present information on the Baseline 1 projects that have been identified. Information on Baseline 2 projects is presented in Tables C-7 through C-9. Maps C-1 and C-2 show the locations of the Baseline 1 and 2 projects.

Table C-1. BASELINE 1 POWER PLANTS IN THE SAN JUAN BASIN REGION

Project Name	Status*	Company	Approximate Location	County	Project	Proposed Time Schedule: Initial Construction	Initial Production	Abandonment
Four Corners Power Plant	1	Arizona Public Service Company	T29N, R15W	San Juan	Coal-fired power plant	Existing	1970	2000
• Particulate Removal	2				Air pollution cleanup	1980	1980	2000
• SO_2 Removal	2				Air pollution cleanup	1981	1981	2000
Plains Escalante Generating Station	2	Plains Electric Generation and Transmission Co-op., Inc.	T14N, R12W	McKinley	Coal-fired power plant	1980	1984	2019-2024
San Juan Generating Station	1	PNM	T30N, R15W	San Juan	Coal-fired power plant	1970	1973	2022
• Unit 4	2				Additional unit	1979	1982	2022
• SO_2 system	2				Pollution cleanup	1980	1982	2022
• Water management system	2				Water management	1981	1983	2022

Note: See Map C-1a for project locations.

*Status: 1 = existing; 2 = under construction.

Table C-2. BASELINE 1 PETROLEUM REFINERIES AND OIL FIELD DEVELOPMENT IN THE SAN JUAN BASIN REGION

Project No./Map Reference	Project Name	Status*	Company	Approximate Location	County	Project	Proposed Time Schedule		
							Initial Construction	Initial Production	Abandonment
B1	Caribou Four Corners Oil	1	Caribou Four Corners, Inc.	T29N, R14W	San Juan	Petroleum refinery	Existing	Existing	Permanent
B2	Giant-Farmington Refinery	1	Giant Refinery Company	T29N, R12W	San Juan	Petroleum refinery	Existing	Existing	Permanent
B3	Plateau, Inc.-Bloomfield Refinery	1	Plateau, Inc.	T29N, R11W	San Juan	Petroleum refinery	Existing	Existing	Permanent
B4	Shell Oil Company-Ciniza Refinery	1	Shell Oil Company	T15N, R15W	McKinley	Petroleum refinery	Existing	Existing	Permanent
B5	Thriftway Company	1	Thriftway Company	T29N, R11W	San Juan	Petroleum refinery	Existing	Existing	Permanent
B6	General Crude Processing	1	General Crude Processing	T30N, R12W	San Juan	Oil treatment plant	Existing	Existing	Permanent
B7	Oil Field Development	1	All Involved	T17N to T32N R1E to R19W	San Juan, Rio Arriba, McKinley, Sandoval	Oil field development	Existing	Existing	Unknown

Note: See Map C-1b for project locations.

*Status: 1 = existing.

Table C-3. BASELINE 1 NATURAL GAS PROCESSING PLANTS AND GAS FIELD DEVELOPMENT IN THE SAN JUAN BASIN REGION

Project No./Map Reference	Project Name	Status*	Company	Approximate Location	County	Project	Proposed Time Schedule		
							Initial Construction	Initial Production	Abandonment
C1	Blanco	1	El Paso Natural Gas Company	T29N, R11W	San Juan	Natural gas processing plant	Existing	Existing	Permanent
C2	Chaco	1	El Paso Natural Gas Company	T26N, R12W	San Juan	Natural gas processing plant	Existing	Existing	Permanent
C3	Kutz Canyon	1	Southern Union Refining Company	T28N, R11W	San Juan	Natural gas processing plant	Existing	Existing	Permanent
C4	Lybrook	1	Southern Union Refining Company	T23N, R7W	Rio Arriba	Natural gas processing plant	Existing	Existing	Permanent
C5	San Juan River	1	El Paso Natural Gas Company	T29N, R15W	San Juan	Natural gas processing plant	Existing	Existing	Permanent
C6	Wingate Plant	1	El Paso Natural Gas Company	T15N, R17W	McKinley	Natural gas processing plant	Existing	Existing	Permanent
C7	Gas Field Development	1	All Involved	T23N to T32N, R1W to R14W	San Juan, Rio Arriba, Sandoval	Gas field development	Existing	Existing	Unknown

Note: See Map C-1b for project locations.

*Status: 1 = existing.

Table C-4. BASELINE 1 COAL MINES IN THE SAN JUAN BASIN REGION

Project No./Map Reference	Project Name	Status*	Company	Approximate Location	County	Project	Proposed Time Schedule		
							Initial Construction	Initial Production	Abandonment
D1	Arroyo No. 1	1	A.J. Firchau	T17N , R2W	Sandoval	Coal strip mine	Existing	Existing	Unknown, but not before 2000
D2	Bisti Mine	1	Sunbelt Mining Company	T23N, R13W	San Juan	Coal strip mine	1987	1980	2040
D3	Black Diamond Mine	2	Black Diamond Coal Company	T32N, R13W	San Juan	Coal strip mine	Unknown	Unknown	Unknown
D4	Con Paso-Burnham Mine	1	Consolidation Coal Company	T25N, R15&16W	San Juan	Coal strip mine	1980	1980	2018
D5	De-na-zin Mine	1	Sunbelt Mining Company	T23N, R13W	San Juan	Coal strip mine	1980	1980	1983
D6	Gallo Wash Mine	2	Alamito Coal Company	T21N, R8&9W	San Juan	Coal strip mine	Within next 10 years	Within next 10 years	40 years after initial production
D7	La Plata Mine	2	Western Coal Company	T32N, R13W	San Juan	Coal strip mine	1983	1984	2009
D8	Lee Ranch Mine	2	SF Coal Corporation	T15N, R7&8W; T16N, R8W	McKinley	Coal strip mine	1982	1983	2009
D9	McKinley Mine	1	Pittsburg and Midway Coal Company	22 miles northwest of Gallup (Navajo Reservation)	McKinley	Coal strip mine	Existing	Existing	2011

Table C-4. BASELINE 1 COAL MINES IN THE SAN JUAN BASIN REGION (concluded)

Project No./Map Reference	Project Name	Status*	Company	Approximate Location	County	Project	Proposed Time Schedule		
							Initial Construction	Initial Production	Abandonment
D10	Mentmore Mine	1	Carbon Coal Company	T16N, R19W	McKinley	Coal strip mine	Existing	Existing	1994-1999
D11	Navajo Mine	1	Utah International, Inc.	7 miles southwest of Fruitland (Navajo Reservation)	San Juan	Coal strip mine	Existing	Existing	2011
D12	San Juan Mine	1	San Juan Coal Company	T30N, R15W	San Juan	Coal strip mine	Existing	Existing	2017
D13	South Hospah Mine	2	Chaco Energy Company	T16&17N, R10W	McKinley	Coal strip mine	1983	1983	2013

Note: See Map C-1c for project locations.

*Status: 1 = existing; 2 = under development.

Table C-5. BASELINE 1 URANIUM MINES AND MILLS IN THE SAN JUAN BASIN REGION

Project No./Map Reference	Project Name	Status*	Company	Approximate Location	County	Project
E1	Churchrock No. 1	1	Kerr-McGee	T17N, R16W	McKinley	Uranium mine
E2	Churchrock No. 1E	1	Kerr-McGee	T17N, R16W	McKinley	Uranium mine
E3	Crownpoint	2	Continental Oil	T17N, R12W	McKinley	Uranium mine
E4	Crownpoint, Sec. 9	1	Mobil	T17N, R13W	McKinley	Uranium mine (in-situ leach)
E5	Enos Johnson	1	R. Williams Mining Company	9 miles west of Sanostee (Navajo Reservation)	San Juan	Uranium mine
E6	Johnny M	1	Ranchers Exploration and Development	T13N, R8W	McKinley	Uranium mine
E7	Mariano Lake	1	Gulf	T15N, R14W	McKinley	Uranium mine
E8	Mt. Taylor	1	Gulf	T13N, R8W	Cibola	Uranium mine
E9	NE Churchrock No. 4	1	United Nuclear	T17N, R16W	McKinley	Uranium mine
E10	Old Churchrock	1	United Nuclear	T16N, R16W	McKinley	Uranium mine
E11	P-10	1	Anaconda	T10N, R5W	Cibola	Uranium mine
E12	Roca Honda (Lee)	2	Kerr-McGee	T13N, R8W	McKinley	Uranium mine
E13	Ruby No. 2 and No. 3	1	Western Nuclear	T15N, R13W	McKinley	Uranium mines
E14	Ruby No. 4	2	Western Nuclear	T15N, R13W	McKinley	Uranium mine
E15	Sec. 12	1	Cobb	T14N, R10W	McKinley	Uranium mine
E16	Sec. 14	1	Cobb	T14N, R10W	McKinley	Uranium mine

Table C-5. BASELINE 1 URANIUM MINES AND MILLS IN THE SAN JUAN BASIN REGION (concluded)

Project No./Map Reference	Project Name	Status*	Company	Approximate Location	County	Project
E17	Sec. 19	1	Kerr-McGee	T14N, R9W	McKinley	Uranium mine
E18	Sec. 22	1	Kerr-McGee	T14N, R10W	McKinley	Uranium mine
E19	Sec. 23	1	Homestake	T14N, R10W	McKinley	Uranium mine
E20	Sec. 25	1	Homestake	T14N, R10W	McKinley	Uranium mine
E21	Sec. 30	1	Kerr-McGee	T14N, R9W	McKinley	Uranium mine
E22	Sec. 30W	1	Kerr-McGee	T14N, R9W	McKinley	Uranium mine
E23	Sec. 32	1	Homestake	T14N, R9W	McKinley	Uranium mine
E24	Sec. 33	1	Kerr-McGee	T14N, R9W	McKinley	Uranium mine
E25	Sec. 35	1	Kerr-McGee	T14N, R9W	McKinley	Uranium mine
E26	Sec. 36	1	Kerr-McGee	T14N, R9W	McKinley	Uranium mine
E27	Ambrosia Lake	1	Kerr-McGee	T14N, R9W	McKinley	Uranium mill
E28	Bluewater	1	Anaconda	T12N, R11W	Cibola	Uranium mill
E29	L-Bar (Seboyeta)	3	Sohio-Reserve	T11N, R5W	Cibola	Uranium mill
E30	Marquez	3	Bokum Resources	T13N, R5W	McKinley	Uranium mill
E31	Milan	1	United Nuclear-Homestake	T11N, R10W	Cibola	Uranium mill
E32	Mt. Taylor	3	Gulf Mineral Resources	T13N, R8W	McKinley	Uranium mill
E33	Sec. 2 (Church Rock)	1	United Nuclear	T17N, R16W	McKinley	Uranium mill

Note: See Map C-1c for project locations.

*Status: 1 = active as of 9/1/81; 2 = under development; 3 = licensed, but not operating as of 9/1/81.

Table C-6. BASELINE 1 OTHER PROJECTS IN THE SAN JUAN BASIN REGION

Project Name	Status*	Company	Counties Involved (State)	Project	Proposed Time Schedule: Initial Construction	Proposed Time Schedule: Initial Production	Proposed Time Schedule: Abandonment
Animas-La Plata Project	3	Bureau of Reclamation (USDI)	San Juan (NM) La Plata (CO) Montezuma (CO)	Municipal and agricultural water supply system	1983	1987	Permanent
Navajo Indian Irrigation Project	1,2	Bureau of Indian Affairs (USDI)	San Juan (NM)	Agricultural water supply system and development	1967	1976	Permanent
Star Lake-Bisti Railroad	3	Star Lake Railroad Company	San Juan (NM) McKinley (NM)	Railroad (common-carrier)	1982	1984	Unknown, but most likely after 2020

Note: See Map C-1c for project locations.

*Status: 1 = existing; 2 = under development; 3 = permitted, but no construction yet.

Table C-7. BASELINE 2 COAL MINES IN THE SAN JUAN BASIN REGION

Project No./Map Reference	Project Name	Status*	Company	Approximate Location	County	Project	Proposed Time Schedule		
							Initial Construction	Initial Production	Abandonment
G1	La Ventana Coal Mine	1	Ideal Basic Industries Coal Company	T19&20N, R1&2W	Sandoval	Underground coal mine	Unknown	Unknown	35 years after initial production
G2	Star Lake Mine	1	Chaco Energy Company	T20N, R6&7W	McKinley	Coal strip mine	Unknown	Unknown	35 years after initial production

Note: See Map C-2 for project locations.

*Status: 1 = permit application being processed.

Table C-8. BASELINE 2 URANIUM MINES IN THE SAN JUAN BASIN REGION

Project No./Map Reference	Project Name	Status*	Company	Approximate Location	County	Project
H1	Ambrosia Lake	1	Cobb	T14N, R10W	McKinley	Uranium mine
H2	Ann Lee	1	United Nuclear	T14N, R9W	McKinley	Uranium mine
H3	Bernabe	1	Conoco	T12N, R2W	Sandoval	Uranium mine
H4	Flea Doris Ext.	1	MM Mining	T13N, R9W	McKinley	Uranium mine
H5	Haystack	1	Todilto Exploration	T13N, R10W	McKinley	Uranium mine
H6	Hope Mine	1	Ranchers	T13N, R10W	McKinley	Uranium mine
H7	Isabella	2	Koppen	T13N, R9W	McKinley	Uranium mine
H8	J.J. No. 1	1	Sohio	T11N, R5W	Cibola	Uranium mine
H9	Marquez No. 1 & No. 2	1	Bokum Resources	T13N, R5W	McKinley	Uranium mines
H10	Mobil	2	Mobil Oil-TVA	T17N, R13W	McKinley	Uranium mine (In-situ leach)
H11	Nose Rock No. 1 & No. 2	1	Phillips Uranium	T19N, R11&12W	McKinley	Uranium mines
H12	Nufuels Pilot	2	Nufuels	T17N, R12W	McKinley	Uranium mine
H13	Piedre Triste	1	Todilto Exploration	T13N, R9W	McKinley	Uranium mine
H14	Poison Canyon	1	Reserve Oil	T13N, R9W	McKinley	Uranium mine
H15	PW-2/3	1	Anaconda	T11N, R5W	Cibola	Uranium mine
H16	Rio Puerco	1	Kerr-McGee	T12N, R4W	Cibola	Uranium mine
H17	Sandstone	1	United Nuclear	T14N, R9W	McKinley	Uranium mine

Table C-8. BASELINE 2 URANIUM MINES IN THE SAN JUAN BASIN REGION (concluded)

Project No./Map Reference	Project Name	Status*	Company	Approximate Location	County	Project
H18	Sec. 13	1	UN-Homestake	T14N, R10W	McKinley	Uranium mine
H19	Sec. 15	1	UN-Homestake	T14N, R10W	McKinley	Uranium mine
H20	Sec. 17	1	Kerr-McGee	T14N, R9W	McKinley	Uranium mine
H21	Sec. 24	1	Kerr-McGee	T14N, R9W	McKinley	Uranium mine
H22	Sec. 27	1	United Nuclear	T14N, R9W	McKinley	Uranium mine
H23	Spencer Shaft	1	Koppen	T14N, R9W	McKinley	Uranium mine
H24	St. Anthony	1	United Nuclear	T11N, R4W	Cibola	Uranium mines (open pit/shaft)
H25	Todilto Exploration	1	Todilto Exploration	T13N, R9W	McKinley	Uranium mine
H26	West Ranch	1	Cobb	T15N, R11W	McKinley	Uranium mine

Note: See Map C-2 for project locations.

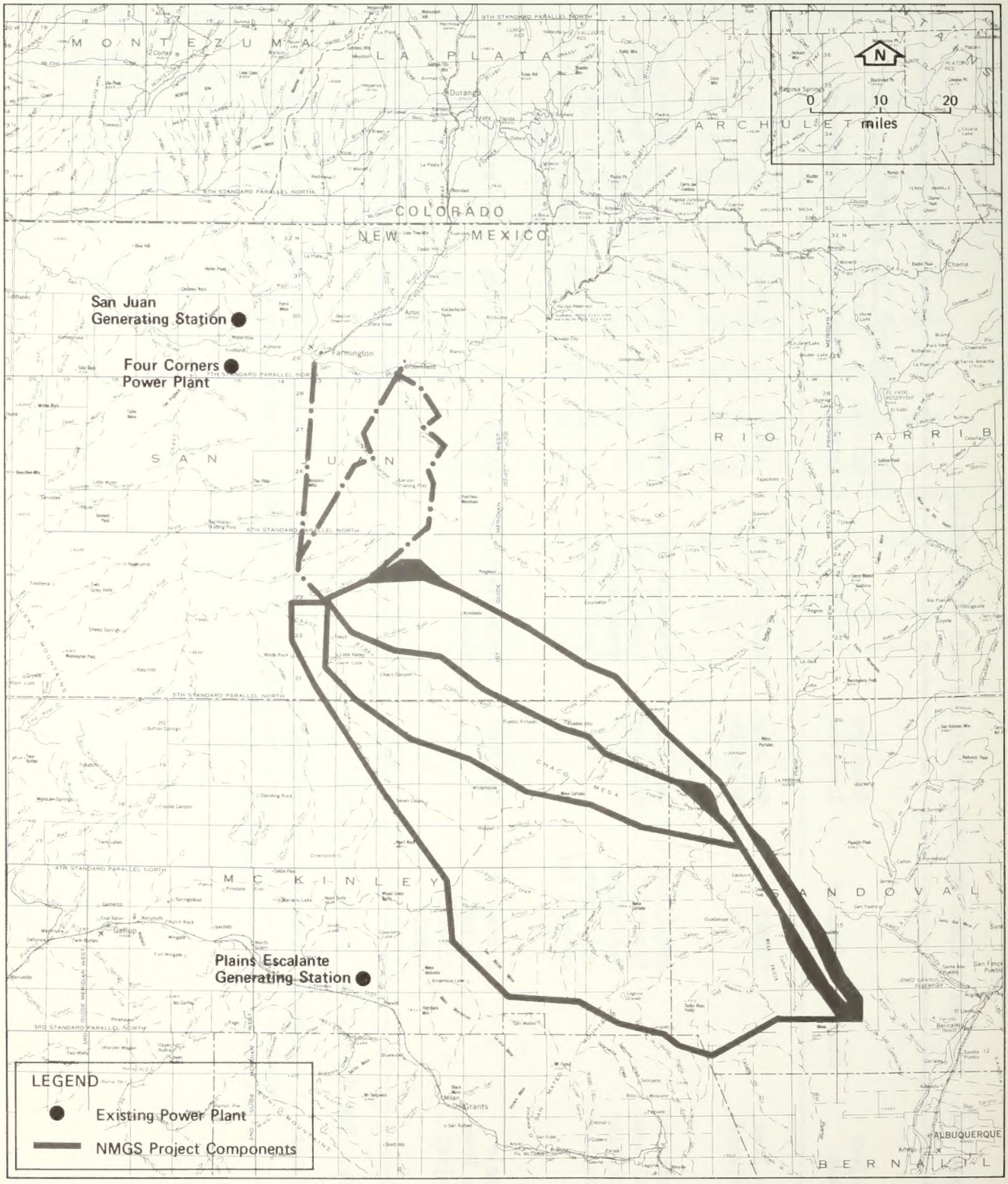
*Status: 1 = permitted mines that are shut down or on hold (as of 9/81); 2 = under development, but some necessary permits still being processed (as of 10/81).

Table C-9. BASELINE 2 OTHER PROJECTS IN THE SAN JUAN BASIN REGION

Project Name	Status*	Company	Counties Involved	Project	Proposed Time Schedule: Initial Construction	Initial Production	Abandonment
Con Paso Railroad	1	CONSOL	San Juan, McKinley	Railroad	1983	1984	2019
Fruitland Coal Load Transmission Line	2	PNM/Plains Electric Generation and Trans. Co-op., Inc.	San Juan, McKinley	Transmission line(s) and associated facilities	Unknown	Unknown	Unknown (when coal mines to be served close; estimated to be at least 35 years after initial production)
Navajo Dam Power Project	3	Bureau of Indian Affairs (USDI)	San Juan	Hydroelectric plant	1975	Unknown	Permanent

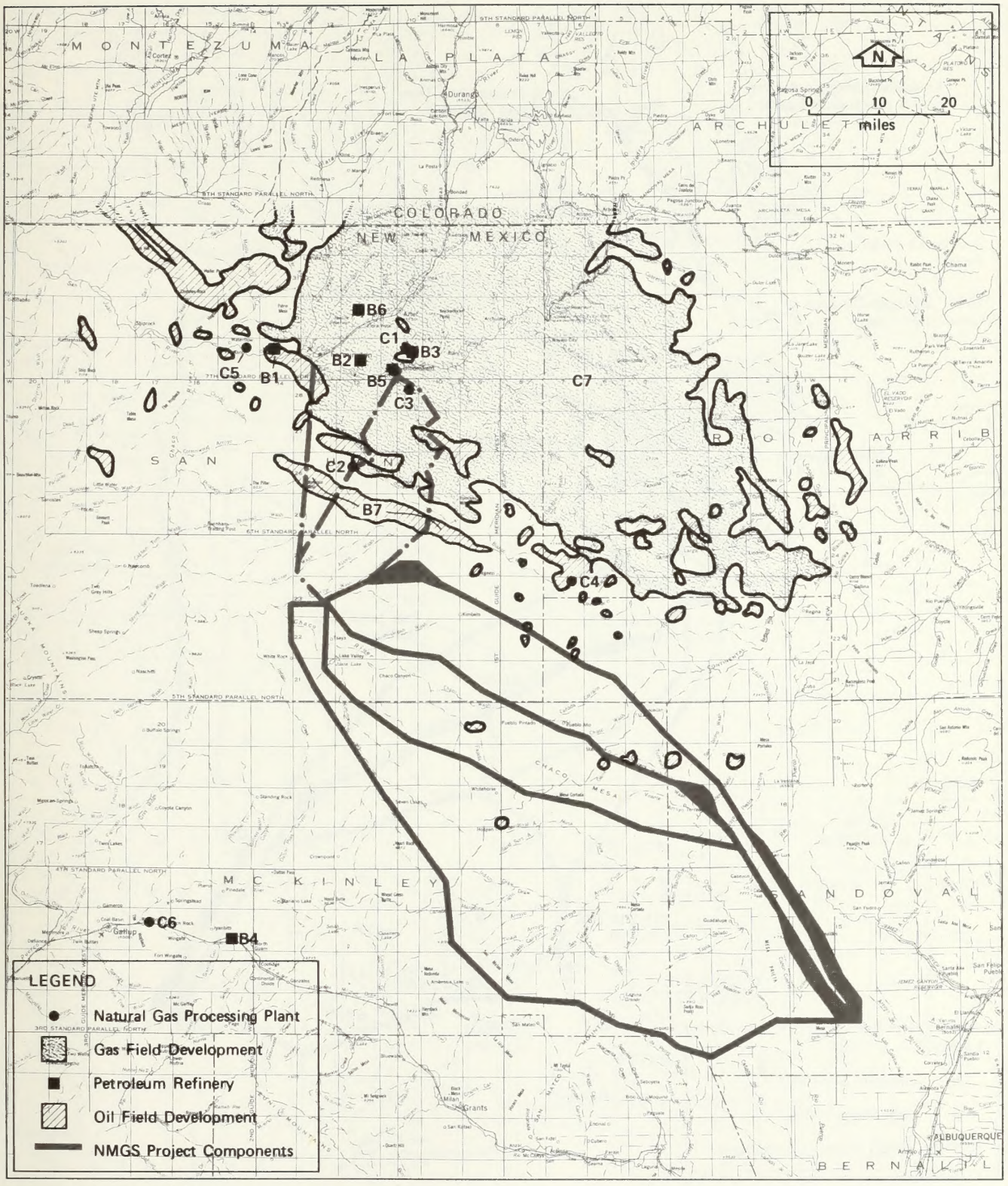
Note: See Map C-2 for project locations.

*Status: 1 = proposed, dependent on outcome of forthcoming EIS; 2 = proposed, dependent on various agency approvals; 3 = partially constructed, completion dependent on resolution of legal problems and outcome of Senate proposal No. 306.



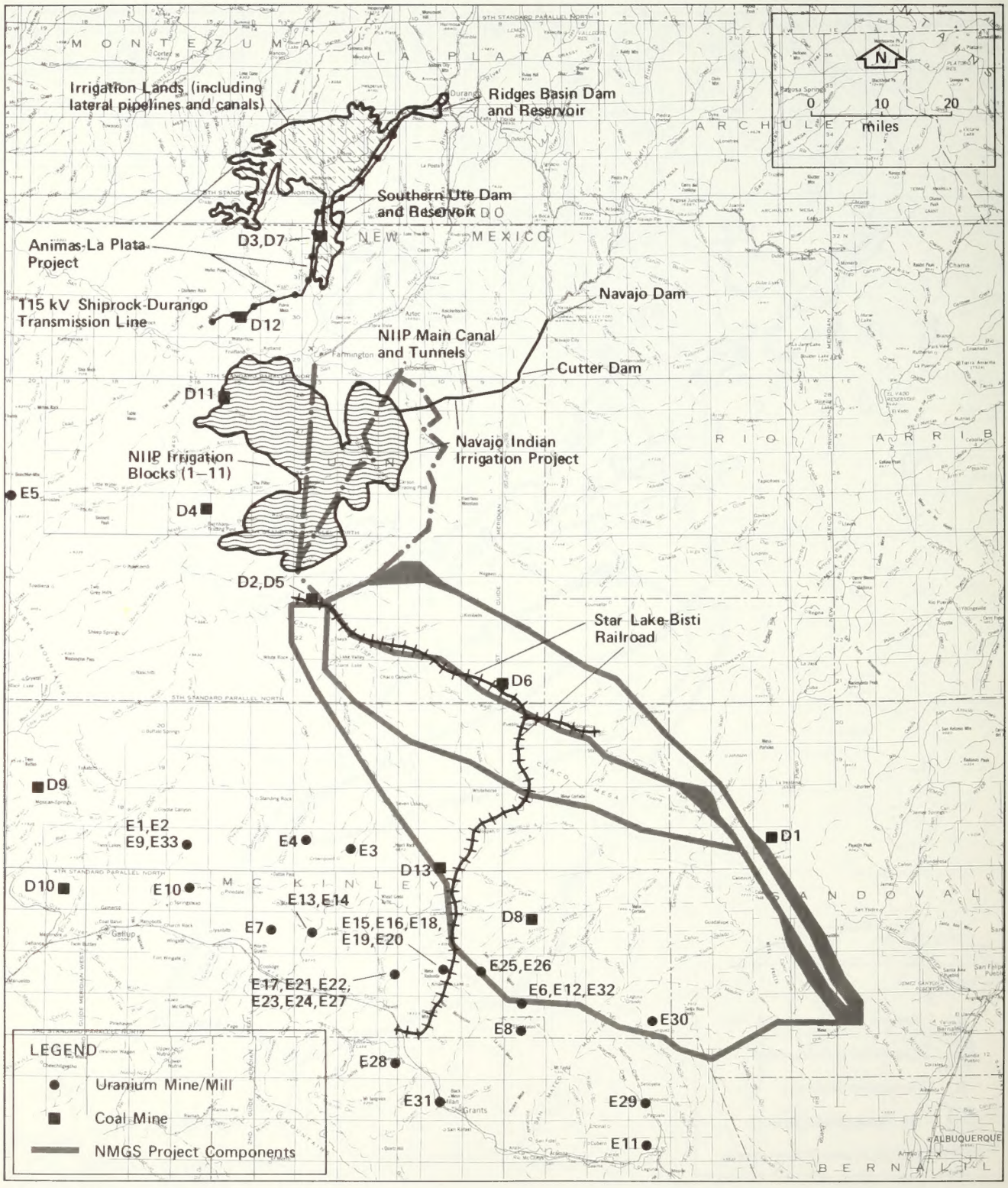
Note: See Table C-1 for project information

Map C-1a. BASELINE 1 PROJECTS IN THE SAN JUAN BASIN REGION



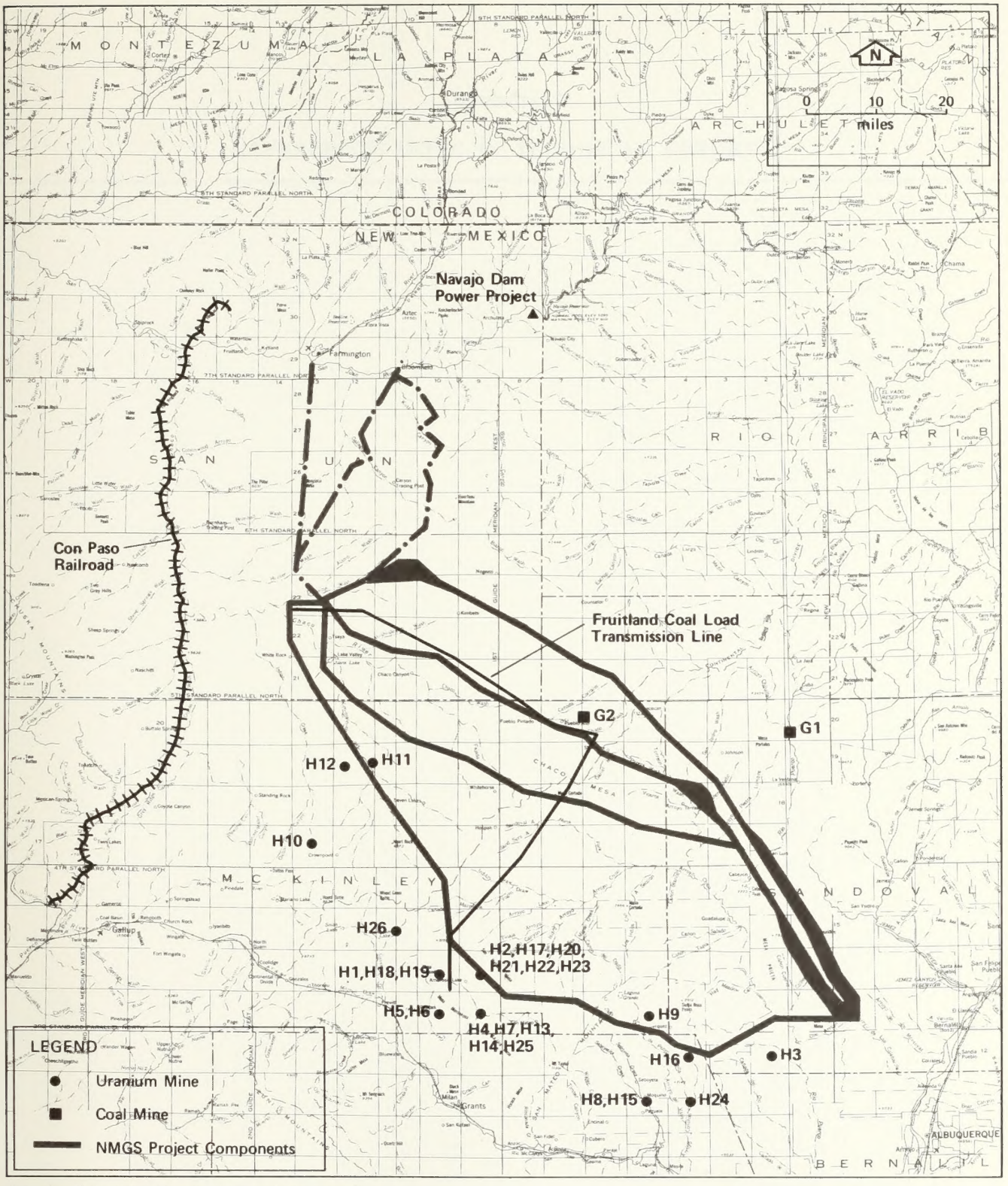
Note: See Tables C-2 and C-3 for project information

Map C-1b. BASELINE 1 PROJECTS IN THE SAN JUAN BASIN REGION



Note: See Tables C-4, C-5, and C-6 for project information

Map C-1c. BASELINE 1 PROJECTS IN THE SAN JUAN BASIN REGION



Note: See Tables C-7, C-8, and C-9 for project information

Map C-2. BASELINE 2 PROJECTS IN THE SAN JUAN BASIN REGION

Appendix D

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Appendix E

PNM PURPOSE AND NEED STATEMENT COMMUNICATIONS

PNM PUBLIC SERVICE COMPANY OF NEW MEXICO
ALVARADO SQUARE ALBUQUERQUE, NEW MEXICO 87158

July 20, 1981

Mr. Charles Luscher
State Director
Bureau of Land Management
Post Office Box 1449
Santa Fe, NM 87501

Dear Mr. Luscher:

Subject: Re-scoping New Mexico
Generating Station (NMGS)

In our July 10, 1981, meeting, PNM indicated NMGS was redefined by the dropping of outside New Mexico requirements and the commitment of that station to New Mexico needs. PNM's forecasts of economic activity incorporate the effect of major business enterprises considering locating in New Mexico, based on inquiries and preliminary negotiations. The redefinition is a result of recent changes affecting PNM's full development loads and resources scenario as described in Attachment II. Attachment II is the Purpose and Need for the proposed project. Attachment I is a project fact sheet.

The redefined NMGS project still consists of a 2000 MW coal-fired generating station with four 500 MW units. The in-service dates for the units are Unit 1-1990, Unit 2-1993, Unit 3-1995, and Unit 4-1998. Associated with the generating station are two 500 kV transmission lines to Albuquerque, 500 kV ties to the Four Corners-Ambrosia 500 kV transmission line, and two water pipelines from the San Juan River to the generating station. PNM will provide the NBEI team a revised and detailed project description by July 24, 1981.

In addition, please be advised that we have assigned Bill Eglinton as the Project Manager. Bill will report to Dave Bedford, the sponsoring Vice-President for NMGS, but we anticipate our principal contact with BLM to be Robert Jackson.

I wish to thank all the BLM and third party contractor staff for their work on this project, especially Dennis Erhart, Leslie Cone and the NBEI team. Please extend this appreciation to Stan Wagner of the Arizona BLM and Gerry Alendal and Bill Payne of the California BLM. Thank them for their early efforts and tell them we regret any inconvenience our change has caused.

Wirth Associates and Woodward-Clyde are also to be thanked for their contribution to the EIS effort. We look forward to continue working with you in the EIS process.

Sincerely,

J. D. Geist
President

JDG:ah
Attachments
cc: C. D. Bedford
J. P. Bumdrant
W. M. Eglinton
J. B. Mulcock
A. J. Robison
R. B. Rountree
E. Yao

ATTACHMENT I

NMGS RESCOPING
FACT SHEET
NEW MEXICO GENERATING STATION

STATION TYPE AND SIZE:	Coal Fired Four (4) 500 Megawatt Units 2000 Megawatts Total
STATION LOCATION:	Bisti Area, San Juan County, approximately 35 miles south of Farmington, New Mexico
STATION OWNERS:	Public Service Company of New Mexico (PNM)
PROJECT MANAGER AND OPERATING AGENT:	Public Service Company of New Mexico
PROJECT TIMETABLE:	Licenses, permits and approvals and land acquisition Mid 1983 Start Engineering 1983 Start Construction 1984 Unit One in Service Mid 1990 Unit Two in Service Mid 1993 Unit Three in Service Mid 1995 Unit Four in Service Mid 1998
PROJECT COST:	Cash cost estimated at 4.6 billion excluding transmission lines and other support items. Approximately 29% of total cost will be devoted to pollution control equipment (sulfur dioxide removal, electrostatic precipitators and water treatment equipment).
COAL SUPPLY:	Mine mouth. Lifetime need of approximately 300 million tons which can readily be supplied from the estimated 4 billion tons of uncommitte strippable, sub-bitumionous reserves within 30 miles of site.
WATER USE:	Each unit would use up to about 8600 acre-feet per year. The plant would be designed for zero discharge of waste water.
WATER SOURCES:	Water would come from one or a combination of the following sources: 1. San Juan River Water. 2. Bisti Area Well Field (4000-6000 feet deep). 3. Uranium Mine Water from Crownpoint are
TRANSMISSION SYSTEM:	1-500 kV transmission loop to already proposed 500 kV Four Corners-Ambrosia-Pajarito transmission line (5 miles), and other transmission facilities as may be needed for in-state deliveries.

WCW:sks
7/15/81

OUTLINE

of

PUBLIC SERVICE COMPANY OF NEW MEXICO'S

PURPOSE AND NEED

for

NEW MEXICO GENERATING STATION PROJECT

---

1. STATEMENT OF PURPOSE

2. BACKGROUND

3. NMGS EIS

TABLE 1
NMGS PROJECT PARAMETERS FOR ENVIRONMENTAL IMPACT ASSESSMENT

PUBLIC SERVICE COMPANY OF NEW MEXICO'S
PURPOSE AND NEED
for
NEW MEXICO GENERATING STATION PROJECT

1. STATEMENT OF PURPOSE

The purpose of this phase of the New Mexico Generating Station (NMGS) Project is to provide the management of the Public Service Company of New Mexico (PNM) with sufficient information to assess the benefits and risks of developing a coal-fired generating station. This risk and benefit analysis will be evaluated against a full range of options to meet the electrical energy needs of PNM's customers in the 1990's and beyond. Among the options considered by PNM are nuclear, geothermal, solar, hydro, conservation, and others. In order to make the best decision, PNM management requires information related to the feasibility and availability of such coal-related resources as land, water, and fuel. Additionally, PNM management requires information regarding the suitability of the proposed project's impact on the human and natural environments in accordance with the NEPA process.

As set forth in the July 10, 1981, letter from PNM to BLM, the proposed project consists of a coal-fired generating station with up to 4 - 500 MW units. The units will be placed in service in the 1990's, with the first unit possibly as early as May, 1990. Associated with the generating station are two 500 kV transmission lines to Albuquerque, a 500 kV tie to the Four Corners-Ambrosia 500 kV lines, and two water pipelines from San Juan River to the generating station.

2. BACKGROUND

Planning and constructing new power generation facilities is a complex and dynamic process. Multiple objectives must be satisfied within the limits of technological and economic feasibility. The chief planning objective is to match the supply of power with the customer's demand.

Given the omnipresent uncertainty of the future and the long time period, often in excess of ten years, that it takes to plan and construct a facility, additional complexity is added. The human, financial, and physical resources committed to such planning are enormous.

PNM's long range planning program is conducted pursuant to the New Mexico Public Utility Act and regulation by the N.M.P.S.C. The company's planning for future generation needs is consistent with its corporate mission to provide adequate and reliable electric service at the lowest cost to the ratepayer while providing a reasonable return to PNM investors.

To accomplish this mission, PNM employs state of the art econometric modeling programs and forecasting techniques. The data deriving from those tools are incorporated into studies which indicate a range of

future load growth. The impact of the increased energy prices, natural gas deregulation, energy and demand conservation, solar energy applications, innovative rate design, and direct load control techniques, are among the various factors accounted for in these analyses.

For more than twenty years, PNM has evaluated and, in some cases, pursued various options for meeting customer energy requirements. Such options have included:

1. Coal - Four Corners Project
   San Juan Project
2. Nuclear - Arizona Nuclear Power Project
3. Geothermal - Baca Geothermal Project
4. Hydro - Pumped Storage Project
5. Solar - Solar Hybrid Repowering Project
6. Conservation and Load Management Programs

These options, along with such technologies as wind, refuse burning, coal gasification, and fuel cells, are being continuously measured against:

- Commercial availability of the technology required for the option
- Availability of the required resources
- Environmental and social impacts
- Capital investment required
- The ability of the corporation to successfully implement the option in the time frame and dollars required.

Load growth in New Mexico is such that a combination of options is required to meet anticipated demand. No single option can meet all needs. Based upon current load growth forecasts, it is anticipated that additional base load generating capability will be required between 1990 and 2000. Therefore, PNM has established the New Mexico Generating Station Project. This project is intended to place emphasis on the coal option for meeting anticipated needs. In examining this option, the company is assessing the feasibility and availability of required resources (land, water, and fuel), and the probable impact on the environment from pursuing such a course. PNM views coal as the best available option for meeting part of the energy requirements of the 1990's. Accordingly, the company has chosen to subject the risks and benefits from coal development to detailed analysis. This analysis will be conducted in conjunction with continued study of the other options presently in use in the generating system.

In summary, the hallmark of system planning must be flexibility. Flexibility is required by the rapidly changing demands for electrical energy and by the rapid changes in the power supply options available to the company. This flexibility must be especially evident in planning new generation facilities. The eight to twelve years required to bring a coal station into commercial operation makes it difficult to establish a "date certain". Nevertheless, the same long lead-time from conception to commercial operation required that the company start very early to assess the risks and weigh the benefits of a given option. This process

takes place while new data and altered circumstances dictate the need to accelerate or slow down the potential completion dates due to changes in the load and resource picture.

3. NEW MEXICO STATION EIS

To assess the NMGS Project as the next potential coal option for the 1990's, PNM has requested the Bureau of Land Management (BLM) to consider the issuance of right-of-way grants for any proposed water conveyance system and transmission lines associated with the project.

In response to PNM's application for those facilities, BLM, New Mexico State Office, was designated as the federal lead agency to prepare the EIS for the project in accordance with the NEPA process.

Depending on the outcome of NEPA/EIS process, and the land, water, and fuel resource acquisitions, PNM recognizes that there are many other regulatory and permit requirements that would have to be met. These include construction permit, location permit, numerous environmental approvals by state and federal agencies, and a certificate of convenience and necessity by the New Mexico Public Service Commission, before any construction would be allowed to begin.

The project parameters assumed for the NMGS Project are presented in Table 1.

TABLE 1

NEW MEXICO GENERATING STATION PROJECT

PROJECT PARAMETERS

FOR

ENVIRONMENTAL IMPACT ASSESSMENT

STATION TYPE & SIZE:	Coal fired Maximum development 2000 MW in 500 MW increments
STATION LOCATION:	Bisti area, San Juan County, New Mexico, approximately 35 miles south of Farmington, New Mexico
MILESTONES:	. Determine the feasibility and/or acquire land, water, and fuel, and complete EIS process (mid-1983) . Decide on whether or not to proceed with permitting and design (mid-1983) . Earliest date anticipated for Unit 1 operation (early to mid-1990) with subsequent units thru the year 2000.
RESOURCE REQUIREMENTS:	
LAND:	Exchange with BLM for PNM owned properties at Ute Mountain area for Federal land near Bisti
COAL SUPPLY:	Lifetime requirement of approximately 300 million tons to be supplied from the San Juan Basin.
WATER SUPPLY:	Each unit would use up to about 8600 acre-feet per year. The plant would be designed for zero discharge of waste water. Water would come from the San Juan River. If not available, water supply would be supplemented from the Bisti area well field.
TRANSMISSION SYSTEM:	1-500 kV transmission loop to the proposed 500 kV Four Corners-Ambrosia-Pajarito transmission line (5 miles), and other transmission facilities as may be needed for subsequent units.

PNM PUBLIC SERVICE COMPANY OF NEW MEXICO
ALVARADO SQUARE ALBUQUERQUE, NEW MEXICO 87158

January 21, 1982

Ms. Leslie Cone
Project Manager
Bureau of Land Management
509 Camino de la Marquez
Santa Fe, NM 87501

Dear Ms. Cone:

Subject: NMGS Purpose and Need

Following the July 10 Rescoping of the New Mexico Generating Station Project, PNM has provided BLM with considerable technical information regarding the Project Description and Load Forecasts. This data serves as the basis for the preparation of the NMGS EIS. While the data provides project description, the attached document is an outline of PNM's purpose and need for the NMGS Project.

The primary purpose of this statement is to emphasize PNM's intention to study carefully the feasibility and availability of such coal plant related resources as land, water, and fuel for needed electrical generation that may materialize as early as 1990. In addition to the acquisition of such resources, PNM wants to assure that the impact resulting from such a project will assess and address the human and natural environment in accordance with the NEPA process. Such resource acquisition and environmental assessment precedes any further corporate commitment to the substantial financial resources necessary for proceeding with final permitting, design, and construction.

This outline is not intended to replace or conflict with information previously provided. Rather, it is intended to convey the intent of the project in this phase and to provide the BLM with the basis for identifying alternatives to this project.

Sincerely,

Bill/msf

W. M. Eglinton
NMGS Project Manager

WME:msf
Attachments
cc: C. D. Bedford

PNM PUBLIC SERVICE COMPANY OF NEW MEXICO
ALVARADO SQUARE ALBUQUERQUE, NEW MEXICO 87158

March 29, 1982

Ms. Leslie Cone
Bureau of Land Management
United States Department of
the Interior
Post Office Box 1449
Santa Fe, NM 87501

Dear Ms. Cone:

Subject: NMGS Statement of Purpose

On January 21, 1982, Public Service Company of New Mexico (PNM) submitted to BLM, our Statement of Purpose for the New Mexico Generating Station. Fundamental to the construction of that generating facility is the associated development of coal resources within the state of New Mexico.

To this end we offer you further elaboration of PNM's purpose of contemplating the utilization of this valuable resource. This statement is in response to questions raised during recent public meetings and should serve to further document PNM's Phase I goals for NMGS.

Background

A. National Energy Policy

Electric utilities are faced with continued increases in electrical demand at a time when traditional energy resources are becoming scarcer and more expensive. The OPEC oil embargo of 1973/1974 forced the United States to review its current policies regarding the importation of large quantities of petroleum fuels for electrical energy production. Subsequent cost increases for gas and oil have also caused utilities to reevaluate their future fuel resources and those companies with the capacity are switching to other methods for supplying baseload electrical power such as coal or nuclear. The United States has adequate supplies of both coal and uranium to meet electrical power demands in the future. Indeed certain projections for New Mexico indicate there exist coal reserves which could last 200 to 300 years with current mining technology and at a similar removal rate. This resource is primarily located in the San Juan Basin of northwest New Mexico.

PNM management had the foresight to predict the rapid depletion of our nation's oil and gas resources in the mid-1950's. They realized that it made prudent business sense to shift from dependence on a single fuel source to

mutliple sources. PNM acquired coal reserves in the San Juan Basin to supply fuel for future units. At the same time, PNM was investigating other base load alternatives such as nuclear. Natural gas is now used primarily for peaking purposes.

PNM has delineated specific objectives, through its fuels planning process by which compliance to National Energy Policies may be met.

These are: (From PNM's Fuels Management Document [Draft])

1. Acquire and/or use those natural resources that are regionally abundant for base load, intermediate and peaking power generation;

2. Improve existing facilities (including transmission) for greater efficiency and reliability while maintaining a desirable environment;

3. Study the possibility of converting existing plants to accept new fuels or utilize new processes to generate electricity based on economics, costs, and benefits;

4. Implement methods to minimize the environmental impact of power production facilities;

5. Promote strong load management and conversation programs;

6. Investigate possibilities for implementing new fuel resources and technologies, such as coal gasification, solar, wind, and geothermal development; and

7. Assure conformity of fuels guidelines with provisions outlined in the PNM Corporate Goals and Objectives.

As can be seen from item #1, a priority is given to development of regional fuel resources.

Additionally, PNM has a basic commitment to assist in stimulating the economy of New Mexico; utilization of Fruitland Formation Coal from the San Juan Basin NM, therefore, meets PNM's primary objectives.

Further elaboration as to the benefits of coal, its availability, etc. are included in the enclosed draft Fuels Management Document.

Sincerely,

William M. Eglinton
NMGS Project Manager

DGS:jam
Enclosure

PNM PUBLIC SERVICE COMPANY OF NEW MEXICO
ALVARADO SQUARE ALBUQUERQUE, NEW MEXICO 87158

May 6, 1982

Ms. Leslie Cone
Project Manager
Bureau of Land Management
509 Camino de la Marquez
Santa Fe, NM 87501

Dear Ms. Cone:

Subject: NMGS Purpose and Need

In my January 21, 1982, letter to you, I have inadvertently left out a word "reasonable" in the third paragraph under section 2: Background of the "PNM's Purpose and Need for NMGS" enclosure. This paragraph should read:

> "PNM's long range planning program is conducted pursuant to the New Mexico Public Utility Act and regulation by the N.M.P.S.C. The company's planning for future generation needs is consistent with its corporate mission to provide adequate and reliable electric service at the lowest reasonable cost to the ratepayer while providing a reasonable return to PNM investors."

In addition, I would like to reiterate the following, which PNM told BLM at the July 10, 1981, meeting between our management and yours:

> "Under both the low and high load forecast scenarios, PNM will have short term power sales without additional transmission lines involved. PNM will not preclude any long term power sales to California and Arizona from NMGS as long as no new transmission lines are required for the sales. If some of the industrial customers or the in-state utilities want ownership in NMGS, PNM will seriously consider them as long as our own needs can be met, the EIS process is not significantly impacted and the in-state transmission system in the current EIS is adequate."

Sincerely,

Bill

W. M. Eglinton
NMGS Project Manager

EY:mkd
cc: Mr. C. D. Bedford
Mr. W. C. Wygant
Mr. Ely Yao

PNM PUBLIC SERVICE COMPANY OF NEW MEXICO
ALVARADO SQUARE ALBUQUERQUE, NEW MEXICO 87158

March 25, 1983

Ms. Leslie Cone
Project Manager
Bureau of Land Management
509 Camino de la Marquez
Santa Fe, NM 87501

Dear Ms. Cone:

Subject: Public Service Company of New Mexico (PNM)
New Mexico Generating Station (NMGS)
Purpose and Need

Pursuant to our meetings in February 1983, we are presenting additional information regarding PNM's Load and Resources forecast to assist you in completing the Final EIS for NMGS. In summary, as we will indicate later in this letter, we believe that the presentation by BLM in the DEIS and in the Technical Report on purpose and need would be unaffected by this additional information.

Before proceeding with a detailed presentation, we will briefly summarize several pertinent points from our previous presentations to you regarding purpose and need.

Summary Review

- The purpose of this phase of the NMGS project is to provide PNM's management with sufficient information to assess the benefits and risks of developing a coal-fired generating station. This risk and benefit analysis will be evaluated against a full range of options to meet the electrical energy needs of PNM's customers in the 1990s and beyond. Of specific interest to us is a regulatory assessment of the feasibility and availability of such coal-related resources as land, water, and fuel as well as the suitability of the proposed project's impact on the human and natural environment in accordance with the NEPA process.

  We understand, and as pointed out in the DEIS, that BLM's need to address the issue of purpose and need stems primarily from NEPA compliance requirements for identifying reasonable project alternatives and assessing the environmental, social, and economic effects of these alternatives. To identify these project alternatives, BLM must assure itself of the reasonableness of the Applicant's proposed action and must be cognizant of the Applicant's time frame of the proposed action.

- Planning for the future electrical needs of our customers is a complex, adaptive, and dynamic process. Uncertainties of the future and increasingly longer lead time to develop a resource, often in the excess of ten years, are just a few considerations that add to the complexitites of the planning process.

- Recognizing these complexities and uncertainties of the future, our approach in presenting PNM's statement of purpose and need for NMGS is to consider five different scenarios about future load growth in New Mexico: low, middle, strong, high, and potential industrial. These growth scenarios essentially bracket and establish an envelope of the probable time frame and future requirements for new generation capacity for PNM's system.

- Based on this approach, a "window of need" for NMGS in the DEIS was identified, placing the probable start-up of the first unit of NMGS sometime between 1988 and 1993 (see enclosed Figure 1). This "window of need" was confirmed in the Technical Report and in my letter of January 21, 1983. In that letter, I indicated "the units will be placed in service in the 1990s with the first unit possibly as early as May 1990". To fulfill the BLM's responsibilities in the analysis of the environmental, social, and economic effects of the proposed action, a proposed time frame for subsequent NMGS units was identified. Accordingly, we selected from among the various possibilities in the "window of need" potential operating dates of 1993, 1995, and 1998 for three successive units. As we have pointed out on previous occasions, these dates reflect a <u>potential</u> schedule. Given the uncertainties of the future, PNM could not and would not imply, by way of reference to such a potential schedule, that the development of NMGS has date certainty.

- Our criteria in selecting the potential schedule are based on the strong growth scenario. We believe it to be a realistic scenario upon which to develop prudent long-term system expansion plans. This is consistent with utility industry practice in resource planning as described in Section 3 of the Technical Report. Specifically, PNM plans its capital expansion so that the additions to plant will match within technical, engineering, and economic constraints, projected loads of the system and provide for adequate reserve margins. Uncommitted capacity, as will as capacity shortfalls, may exist from time to time. These situations can develop as a result of changing economics or other conditions. Therefore, actual experience is used to modify plans so that the utility acheives the maximum flexibility possible for its customers and stockholders. Thus, PNM's commitment to construct each unit will be based on this type of analysis rather than fixed in-service dates.

Presentation of Information

Enclosed are the following:

1. Revised Tables 6-1 and 6-2 from the Technical Report.

2. A table presenting a revised planned capacity, including planned capacity purchases from Southwestern Public Service Company (SPS).

3. Revised Figure 6-4 from the Technical Report.

4. Updated Tables 6-1 and 6-2 from the Technical Report which exclude only the system requirements of New Mexico Electric Service Company (NMES).

In addition, a current copy of the System Expansion Plan has been transmitted to you under separate cover.

Enclosure 1

Enclosure 1 presents a revision of Tables 6-1 and 6-2 from the Technical Report. These two tables present PNM's current energy resource requirements from 1981 through 2002 for the five scenarios: low, middle, strong, high, and potential industrial. In general, the current forecast, as compared to the December 1981 forecast, which was furnished to BLM in preparing the DEIS, shows a reduced projected load growth. This change is due principally to the less optimistic outlook of the national and state economy.

Enclosure 2

Enclosure 2 is a revised presentation of the planned resources taking into account the following changes:

- The deletion of the system requirements of NME. In November 1982, PNM and NME mutually agreed that it would be in the best interest of the respective shareholders of the two companies that the proposed merger be cancelled.

- In late 1982, PNM concluded an interchange resource agreement with SPS. This agreement provides for PNM to purchase contingent capacity from SPS through the year 2011.

Enclosure 3

Enclosure 3 is a revised Figure 6-4 from the Technical Report. It presents a plot of the five forecast scenarios, the existing and planned resources excluding NMGS, as well as total planned resources including NMGS.

It is important to note that while the "window of need" for NMGS has shifted by a few years, it remains consistent with our earlier representations of a need for NMGS in the 1990s. The strong growth scenario again was used as the guide in identifying the time frame when NMGS might be needed for purposes of EIS analysis.

Enclosure 4

Enclosure 4 is an update of Tables 6-1 and 6-2 from the Technical Report, excluding only the impacts from the proposed merger of NME.

System Expansion Plan

I understand that BLM was interested in some insight to the type of submittals by PNM to the New Mexico Public Service Commission (NMPSC). PNM provides a multitude of financial, accounting and operational information as well as system expansion data. That data is contained in a document titled "System Expansion Plan (SXP)".

The SXP is one of many in-house reference documents which assists PNM's Board of Directors and company officers in addressing the planning options for the company. Started in 1970, the document presented load and resource data, for the near-term budget process (up to five years). Later, it was modified to include, consistent with the budget process as well, ten and twenty year forecasts. The middle growth scenario is an extension of the budget process and was found to be more appropriate in characterizing the trend of the near-term financial needs. Actual approvals of capital expenditures are made annually or on an as needed basis and reflect the financial needs of specific projects. Thus, although the Board does not explicitly approve the SXP, it does approve the capital expenditures for projects or phases of projects which require funds in the near term. Major programs such as NMGS are funded only as required to complete each phase. Therefore, since NMGS does not have a date certain, the board has only authorized at this time those funds required for the planning phase.

Summary

We hope that the information presented in this letter will help to clarify understandings with regard to these matters. Since submittal of load and resources data in December 1981, the changes that have taken place have had no material effect on our view regarding the need for NMGS. The "window of need" for NMGS continues to be in the early to mid 1990's. That is, the purpose of the project, the planning process, and the need for NMGS remains the same as you have described it in the DEIS and the Technical Report.

If there is any additional information you may need, please do not hesitate to let us know.

Very truly yours,

William M. Eglinton
Project Manager

WME:wpc
Enclosure

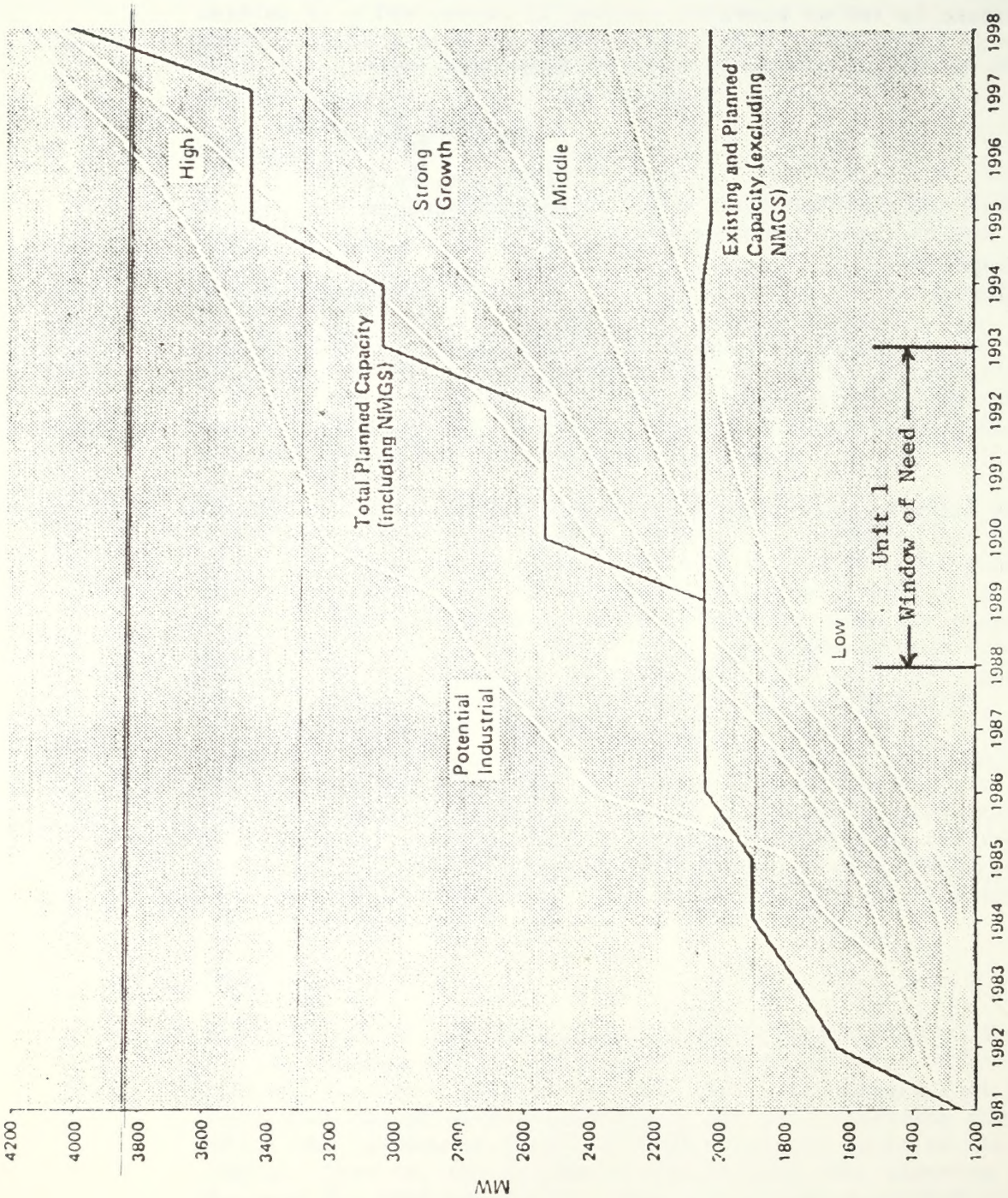

Figure 6-4. SUMMARY OF PNM FORECAST SCENARIOS AND PLANNED CAPACITY ADDITIONS (peak requirements MW)

Enclosure 1

TABLE I
CURRENT GROWTH SCENARIOS
AND RESOURCE PROJECTIONS
(GWh)

Year	Scenario					Existing and Planned Energy Production (Excluding NMGS)	Energy Provided By NMGS
	Low	Middle	Strong Growth	High	Potential Industrial		
1981	5,783	5,840	5,908	5,976	5,842	5,175	0
1982	5,983	6,062	6,107	6,152	6,345	7,845	0
1983	6,134	6,228	6,284	6,339	6,827	7,934	0
1984	6,381	6,392	6,586	6,780	7,938	8,732	0
1985	5,435	5,642	5,812	5,982	8,392	9,540	0
1986	5,679	6,021	6,217	6,413	11,640	10,349	0
1987	6,003	6,533	6,745	6,956	12,290	10,349	0
1988	6,399	7,157	7,369	7,581	13,325	10,349	0
1989	6,750	7,780	8,014	8,248	13,912	10,349	0
1990	7,034	8,368	8,647	8,926	16,030	10,349	0
1991	7,300	8,863	9,191	9,519	16,353	10,905	0
1992	7,535	9,345	9,742	10,183	16,802	10,905	0
1993	7,796	9,827	10,317	10,806	17,269	10,905	2,847
1994	7,914	10,186	10,801	11,416	17,728	10,905	2,847
1995	8,094	10,614	11,377	12,139	18,263	10,685	2,847
1996	8,336	11,123	12,053	12,983	18,873	10,685	2,847
1997	8,574	11,637	12,763	13,889	19,473	10,685	5,694
1998	8,686	12,004	13,337	14,669	20,128	10,685	5,694
1999	8,874	12,458	14,023	15,587	21,046	9,087	8,541
2000	9,122	12,989	14,816	16,643	22,102	9,087	8,541
2001	9,371	13,539	15,655	17,770	23,229	9,087	8,541
2002	9,600	14,081	16,519	18,957	24,416	9,087	11,388

TABLE 2
CURRENT GROWTH SCENARIOS
AND RESOURCE PROJECTIONS
(MW)

Year	Scenario*					Existing and Planned Capacity (Excluding NMGS)	Capacity Provided By NMGS
	Low	Middle	Strong Growth	High	Potential Industrial		
1981	1,115	1,130	1,145	1,161	1,130	1,047	0
1982	1,145	1,168	1,180	1,193	1,187	1,475	0
1983	1,178	1,207	1,225	1,243	1,259	1,473	0
1984	1,190	1,218	1,254	1,290	1,500	1,601	0
1985	1,052	1,109	1,158	1,206	1,620	1,731	0
1986	1,087	1,175	1,232	1,289	2,220	1,861	0
1987	1,138	1,268	1,332	1,396	2,340	1,861	0
1988	1,210	1,388	1,454	1,520	2,528	1,861	0
1989	1,273	1,510	1,582	1,655	2,636	1,861	0
1990	1,324	1,622	1,708	1,793	3,024	1,861	0
1991	1,378	1,722	1,819	1,915	3,086	1,961	0
1992	1,423	1,816	1,928	2,040	3,152	1,961	0
1993	1,471	1,907	2,041	2,174	3,225	1,961	500
1994	1,481	1,967	2,127	2,287	3,348	1,961	500
1995	1,523	2,058	2,251	2,443	3,456	1,945	500
1996	1,568	2,158	2,388	2,617	3,580	1,945	500
1997	1,613	2,260	2,531	2,802	3,700	1,945	1,000
1998	1,620	2,317	2,634	2,951	3,830	1,945	1,000
1999	1,662	2,412	2,778	3,144	4,023	1,654	1,500
2000	1,706	2,513	2,935	3,358	4,237	1,654	1,500
2001	1,751	2,618	3,103	3,587	4,466	1,654	1,500
2002	1,790	2,719	3,272	3,824	4,703	1,654	2,000

*20 percent reserve margin is included in the peak projections.

Enclosure 2

CURRENT PLANNED CAPACITY
FROM: 1/83 SYSTEM EXPANSION PLAN
(MW)

Year	Existing and Planned Capacity Excluding SPS & NMGS[a]	SPS	Existing and Planned Capacity Excluding NMGS	NMGS[b]	Existing and Planned Capacity
1982	1,475	--	1,475	--	1,475
1983	1,473[c]	--	1,473	--	1,473
1984	1,601	--	1,601	--	1,601
1985	1,731	--	1,731	--	1,731
1986	1,731	--	1,861	--	1,861
1987	1,861	--	1,861	--	1,861
1988	1,861	--	1,861	--	1,861
1989	1,861	--	1,861	--	1,861
1990	1,861	--	1,861	--	1,861
1991	1,861	100	1,961	--	1,961
1992	1,861	100	1,961	--	1,961
1993	1,861	100	1,961	500	2,461
1994	1,861	100	1,961	500	2,461
1995	1,745	200	1,945	500	2,461
1996	1,745	200	1,945	500	2,461
1997	1,745	200	1,945	1,000	2,945
1998	1,745[d]	200	1,945	1,000	2,945
1999	1,454	200	1,654	1,500	3,154
2000	1,454	200	1,654	1,500	3,154
2001	1,454	200	1,654	1,500	3,154
2002	1,454	200	1,654	2,000	3,654

[a] Except where noted, figures are comparable to the resource projection of the original EIS Technical Report.

[b] Reflects unit sizes of 500 MW each, with timing as indicated in the above listed source.

[c] Reflects a PNM estimate at a one year delay for Palo Verde Units 1, 2, and 3 becoming dependable capacity.

[d] Reflects retirement of gas/oil steam and gas turbine units.

Enclosure 3

REVISED FIGURE 3-4. Summary of PNW
SCENARIO'S AND PLANNED CAPACITY
ADDITIONS (peak requirements MW)
Unit 1 Window of Need
MW
Year

Enclosure 4

TABLE 1
UPDATE TO TABLE 6-1
EXCLUDES NME
(GWH)

Year	Scenario					Existing and Planned Energy Production (Excluding NMGS)	Energy Provided By NMGS
	Low	Middle	Strong Growth	High	Potential Industrial		
1981	5,783	5,840	5,908	5,976	5,842	5,175	0
1982	6,130	6,286	6,396	6,506	6,345	7,923	0
1983	6,075	6,329	6,622	6,915	6,827	8,732	0
1984	5,854	6,143	6,541	6,939	7,938	9,540	0
1985	6,043	6,481	6,872	7,263	8,392	9,540	0
1986	6,526	7,069	7,487	7,904	11,640	10,349	0
1987	7,210	7,826	8,248	8,670	12,290	10,349	0
1988	8,004	8,649	9,057	9,464	13,325	10,349	0
1989	8,641	9,325	9,810	10,294	13,912	10,349	0
1990	9,132	9,921	10,515	11,109	16,030	10,349	2,847
1991	9,427	10,290	11,017	11,743	16,353	10,349	2,847
1992	9,756	10,772	11,660	12,548	16,802	10,349	2,847
1993	10,040	11,241	12,313	13,385	17,269	10,349	5,694
1994	10,389	11,763	13,040	14,316	17,728	10,349	5,694
1995	10,685	12,305	13,818	15,330	18,263	9,587	8,541
1996	11,036	12,864	14,645	16,426	18,873	9,587	8,541
1997	11,322	13,393	15,446	17,498	19,473	9,587	8,541
1998	11,661	13,945	16,304	18,663	20,128	9,587	11,388

Sources: "Purpose and Need Technical Report," October 1982, Table 6-1, page 6-4. Both NME load growth and capacity have been removed

TABLE 2
UPDATE TO TABLE 6-2
EXCLUDES NME
(MW)

Year	Scenario					Existing and Planned Capacity (Excluding NMGS)	Capacity Provided By NMGS
	Low	Middle	Strong Growth	High	Potential Industrial		
1981	1,115	1,130	1,145	1,161	1,130	1,047	0
1982	1,136	1,175	1,205	1,235	1,187	1,471	0
1983	1,098	1,154	1,226	1,296	1,259	1,601	0
1984	1,086	1,152	1,246	1,338	1,500	1,731	0
1985	1,154	1,250	1,344	1,439	1,620	1,731	0
1986	1,235	1,361	1,464	1,567	2,220	1,861	0
1987	1,360	1,504	1,613	1,722	2,340	1,861	0
1988	1,506	1,658	1,770	1,880	2,528	1,861	0
1989	1,614	1,781	1,916	2,049	2,636	1,861	0
1990	1,692	1,889	2,052	2,214	3,024	1,861	500
1991	1,741	1,956	2,150	2,345	3,086	1,861	500
1992	1,778	2,029	2,261	2,492	3,152	1,861	500
1993	1,830	2,124	2,399	2,673	3,255	1,861	1,000
1994	1,891	2,227	2,549	2,869	3,348	1,861	1,000
1995	1,941	2,334	2,709	3,084	3,456	1,745	1,500
1996	2,001	2,442	2,880	3,317	3,580	1,745	1,500
1997	2,050	2,544	3,045	3,544	3,700	1,745	1,500
1998	2,104	2,651	3,222	3,792	3,830	1,745	2,000

Sources: "Purpose and Need Technical Report," October 1982, Table 6-2, page 6-5. Both NME load growth and capacity have been removed.

NM 30840 EIS
1792.41(6)

PNM PUBLIC SERVICE COMPANY OF NEW MEXICO
ALVARADO SQUARE ALBUQUERQUE, NEW MEXICO 87158

BLM
MAY 31 1983
STATE OFFICE
SANTA FE, N.MEX

May 27, 1983

Div.-Res.
P&ECS
/ NMGSPS
Bio.Res.
Lnds&Rec.
Energy&Min.
CF

Ms. Leslie Cone
Bureau of Land Management
New Mexico State Office
Box 1449
Santa Fe, NM 87501

Dear Ms. Cone:

Subject: Response to Request May 16, 1983
on Purpose and Need Questions

The Purpose and Need/Alternatives questions and comments embrace the general issues of ownership and timing. Therefore, PNM has consolidated its response to these questions and comments. This is a reiteration of comments contained in Bill Eglinton's letters to you of January 21 and March 29, 1982. Also the March 25, 1983, letter to you serves as the information base from which WCC should update the Purpose and Need Technical Report and the EIS.

The goal of the current phase of the project remains unchanged. This phase is intended to provide PNM management an assessment of the potential and associated risks and benefits of developing a coal-fired generating station in northwest New Mexico. PNM has assessed extensively its options to meet its customers future electricity requirements and has determined that New Mexico Generating Station (NMGS), as a long-term baseload generation facility, is the best option to assist in meeting the future electricity requirements of its customers. Additionally, PNM is pursuing the acquisition of land, fuel, and water resources to minimize uncertainties in planning for future electric requirements which, in turn, will minimize costs to ratepayers. Long lead times are required to perform the necessary tasks, often in excess of ten years (as opposed to considerably shorter lead times suggested to BLM in NMGS EIS comments). Therefore, NMGS is in a preliminary phase of resource acquisition with the NEPA EIS serving as a forum for the public to read and comment on the environmental impacts of the proposed actions. It is an essential step to the subsequent permitting, financing, design, and construction activities.

This explanation is offered which helps to reconcile perceived differences in NMGS unit timing and size. It must be understood that the sources of differing information are to be expected as a result of PNM's continual reevaluation of our plans as new and better data become available as well as the different emphases of the particular studies. The System Expansion Plan (SXP) assesses the range of options available to PNM to meet its long-term generation and transmission resource requirements. In addition, it identifies the most viable of those options based on the range of growth predicted and available technology, and serves as a budget planning tool for forecasting capital expenditures. Specifically then, PNM's corporate budget, which is short-term oriented, reflects only the dollars

required to accomplish the assessment objectives for this phase of NMGS. Although the EIS addresses maximum ultimate development of four 500 MW units, final Corporate approval of construction costs, timing, and size of NMGS units has not been granted.

The 1983, G.O.33 filing with the New Mexico Public Service Commission states it impractical for PNM to install a 500 MW coal-fired unit without joint participants. This comment was with respect to present resource levels, not with resource levels that PNM will have when NMGS is needed to meet New Mexico loads. Additionally, PNM currently owns most of an approximately 500 MW unit without increasing its required reserve margin due to hazard sharing agreements with other utilities. Such arrangements, should they be required, would be available for NMGS. The option to have participants in NMGS provides planning flexibility required by the uncertainties of future resource requirements.

PNM is not attempting to justify the building of a new power plant based upon any single load forecast. PNM has identified that within the possible ranges of forecast, NMGS may be required to meet system needs in the 1990s. Further, part of NMGS may be required by other New Mexico utilities and if it is deemed beneficial to New Mexico ratepayers, joint participation (power sales, ownership, etc.) with out of state utilities may also be considered.

It has been standard practice for the NMPSC to wait for a satisfactory "Record of Decision" on an EIS, as well as requesting that PNM define the fuel source, water availability, an adequate site, and demonstrate a need for the power prior to considering PNM's request to license a new generation facility. It is at that point that PNM testifies to the most likely load forecast which exists at that time. That forecast must be within the envelope identified in the EIS. If the forecast is higher, PNM will be able to construct the facility in time to meet the need, assuming the EIS and other permits have been obtained. IF the forecast is below the low range of the envelope, PNM will not request NMPSC approval.

We hope that this brief response helps you in answering questions posed during the NMGS EIS comment period.

Sincerely,

Dan Peck

Dan Peck
Manager, Environmental Affairs

DS:wpc
xc: Mr. Bill Eglinton

Appendix F

AUTHORIZING ACTIONS

FEDERAL

Bureau of Land Management (BLM)

The BLM is responsible for authorizing the actions below and for coordinating the preparation of ROW stipulations by affected federal agencies to ensure consistency between agencies.

1. Issuance of an approval of the use of land for the NMGS site (now held by BLM), whether through a ROW grant, lease, sale, or exchange.
2. Issuance of a grant of ROW for construction and operation of water pipelines, transmission lines, and associated facilities (e.g., pump stations, communication lines, access roads, microwave towers). The proposed and alternative transmission lines would cross from 4.7 to 64.4 miles of public land, depending on which alternatives are selected. The proposed and alternative water pipelines would cross from 8.6 to 36.2 miles of public land, depending on which alternative is selected. The ROW application would be processed under the authority of Title IV of the Federal Land Policy and Management Act of 1976 (FLPMA, 43 CFR Part 2800). The ROW grants would be issued by the BLM New Mexico State Office.
3. Prior to construction, temporary use permits (TUPs) would be required for temporary work and storage sites at drainage crossings, highway and railroad crossings, or other utility crossings. These permits would be issued by the appropriate BLM District Office under the authority of 43 CFR 2800, as detailed in the Federal Register, July 1, 1980.
4. Issuance of an undetermined number of Noncompetitive (Negotiated) Sales of Mineral Material (commercial fill, sand and gravel, and other surfacing or construction material of common variety) under 43 CFR 3611, Noncompetitive Sales. These would be issued by the appropriate BLM District Office.

The BLM and all federal agencies are also responsible for compliance with certain applicable federal laws, orders, and regulations. For this project they are:

- Endangered Species Act of 1973 (as amended), Section 7, in accordance with 50 CFR 402, Interagency Cooperation
- Executive Order 11593 (Protection and Enhancement of the Cultural Environment) and the Historic Preservation Act of 1966 (as amended), Section 106, in accordance with 36 CFR 800 (Protection of Historic and Cultural Properties)
- Executive Order 11988, Floodplain Management
- Executive Order 11990, Protection of Wetlands

Environmental Protection Agency (EPA)

- Under statutory authority of the Clean Air Act Amendments of 1977 and regulatory authority 40 CFR 5221 and 40 CFR 124, a Prevention of Significant Deterioration (PSD) Permit would be required to prevent the deterioration of air quality. Partial

authority for this permit was transferred to NMEID in February 1982. At present, the NMEID performs technical review of the application and the EPA would grant the permit.

- Under authority of the Clean Air Act Amendments of 1977 and 40 CFR 60, a New Source Performance Review Notification would be filed with the EPA. This notification applies to the construction of new air pollution sources subject to EPA-New Source Performance Standards (NSPS).
- A National Pollutant Discharge Elimination System (NPDES) Permit would be required if hydrostatic pipeline test water or plant discharge wastewater is discharged into the San Juan River or any other stream. NPDES permits are issued under the authority of Section 402 of the Clean Water Act and Public Law 95-217.

Bureau of Reclamation (BR)

- Under the Colorado Storage Project Act of 1956, and as implemented by the Navajo Indian Irrigation Project Act of 1962, a contract with the Secretary of Interior would need to be obtained if the applicant intends to obtain uncontracted water from the Navajo Reservoir.
- Under the Colorado Storage Project Act of 1956, and as implemented by the Navajo Indian Irrigation Project Act of 1962, approval of the Secretary of Interior would be required if the applicant intends to negotiate a contract with a water user who has an existing contract for Navajo Reservoir water.

Army Corps of Engineers (COE)

- Under Section 404 of the Clean Water Act of 1977, as implemented by COE regulations (33 CFR 323), a Section 404 permit would be required for construction of the water intake structure on the San Juan River. On the basis of the project description information and an impact assessment supplied by the applicant, COE Albuquerque District Office will coordinate the permit application.

Bureau of Indian Affairs (BIA)

The proposed and alternative transmission lines would cross from 19.4 to 39.8 miles of lands under BIA jurisdiction, depending on which alternatives are selected. The proposed and alternative water pipelines would cross from 0.3 to 24.8 miles of lands under BIA jurisdiction, depending on which ROW is selected.

- The BIA is responsible for the issuance of any grants of ROW for construction and operation of a pipeline through Indian tribal lands. The BIA exercises the Secretary of the Interior's trust responsibility for review and approval of agreements between the Indian tribes and private companies concerning development on Indian land. Secretarial approval of actions on Indian lands, in his trust capacity, are independent of ROW approval on public lands. A grant of the proposed ROW and approval of any of the related developments discussed in this EIS does not commit the Secretary of the Interior to any decision regarding Indian lands.
- The ROW would be approved subject to standard requirements imposed by the terms and conditions of the ROW grant including duration of the grant, ROW widths, fees or costs, and bonding to secure obligations. Rights-of-way across Tribal Trust Lands administered by the BIA as well as Indian Tribal Fee Lands would be negotiated with the respective Indian tribes. Rights-of-way across individual trust (allotted) lands administered by the BIA would be negotiated with the individual Indian owners.
- Authority for issuance of these ROWs would rest with the superintendent in charge of the reservation on which the lands involved are situated, in accordance with 25 CFR 161.25, Rights of-Way over Indian Lands.

Forest Service (FS)

The T4 transmission line alternative would cross 10.3 miles of FS lands.

- In the event that FS lands would be crossed by a transmission line alternative (Cibola National Forest), an existing cooperative agreement provides for procedures and assigns

responsibility for the processing, granting, and administration of the ROW and related facilities to BLM.

STATE OF NEW MEXICO

New Mexico Environmental Improvement Division (EID)

- Under the New Mexico Air Quality Control Act (Section 74-2-7) and EID Regulation 702, a Permit to Construct would be required in order to comply with New Mexico Ambient Air Quality Standards. Regulations apply to projects which would emit pollutants greater than 10 pounds per hour or 25 tons per year.
- Under the New Mexico Water Quality Control Act (NMSA 1978) and Regulation 1-201 of the New Mexico Water Quality Control Commission (July 2, 1981), a Notice of Intent to Discharge must be filed if hydrostatic pipeline test water or plant discharge wastewater is discharged to any streams.
- If hydrostatic pipeline test water is discharged so that it may move directly or indirectly to ground water, a Discharge Plan must be submitted and approved by the Director of EID according to Section 3-106.C of New Mexico Water Quality Control Commission Regulations.
- Under Regulation 3-106 of the New Mexico Water Quality Control Commission, a Discharge Plan would have to be submitted to NMEID before operation of the evaporation and coal-pile runoff ponds could begin.
- Under Regulation 1-202 of the New Mexico Water Quality Control Commission, a Sewage Treatment Design Plan would be filed with the New Mexico Water Pollution Control Bureau of EID.

New Mexico State Engineer (SE)

- A permit application has been filed by the applicant with the SE to appropriate underground water from a declared water basin (San Juan Basin). The applicant is currently waiting for a determination from the State Engineer.
- Under NMSA-1978 and Article 72-5, a Permit to Appropriate the Surface Waters of New Mexico would be required. The permit would be required because the construction of a dam at the water storage reservoir falls under the statutory authority of the SE to ensure safety of dams that would impound public water.
- Under New Mexico Surface Water Code of 1907 and Article 72-5 of NMSA-1978, a Point of Diversion Permit would be necessary for construction of a water intake and diversion on the San Juan River.

New Mexico Public Service Commission (PSC)

- A Certificate of Public Convenience and Necessity and a Location Permit would be required before the applicant could begin construction or operation of the proposed plant, system, or extension thereof. Application would be made as specified by the Public Utility Act of 1967 and NMSA-1978 (Chapters 62-9-1 through 62-9-3).

New Mexico Highway Department (HD)

A permit to install utility facilities within public ROWs would be required whenever a transmission line or water pipeline would cross or be placed within a federally funded or state highway.

Appendix G

LOCATION MAPS

Note: Strip maps included as Appendix G of the DEIS are not reprinted. Map G-14 is changed to include all of the south half of section 22. In addition, Maps G-4, G-12, G-13, G-24, and G-30 should be corrected to include only the west half of section 13.

Appendix H

BIOLOGICAL ASSESSMENT

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
NEW MEXICO STATE OFFICE
P.O. BOX 1449
SANTA FE, NEW MEXICO 87501

IN REPLY REFER TO
NM 30840 EIS
6840 (934A)

June 24, 1983

Memorandum

To: Regional Director, USFWS, Albuquerque, NM

From: State Director, BLM, Santa Fe, NM

Subject: Section 7 Consultation - Proposed New Mexico Generating Station and Ute Mountain Land Exchange

Enclosed is our Biological Assessment (BA) concerning the subject proposals. On November 19, 1981, the Bureau of Land Management (BLM) initiated a list request with your office pursuant to Section 7 of the Endangered Species Act (ESA) of 1973 (as amended) for the New Mexico Generating Station (NMGS) EIS. We received a species list on December 1, 1981 which was amended on December 18, 1981. This list was further amended by our request (memoranda of August 10, 1982 and May 6, 1983) to include species affected by potential acid precipitation effects and category 1, candidate animal species. The species list amendments were received on September 1, 1982 and June 6, 1983 respectively.

A technical report entitled "Threatened and Endangered Species" (report 15 of 22) was prepared in support of the NMGS EIS and was circulated to cooperating agencies (including the Region 2 USFWS Offices of Endangered Species and Ecological Services) and has been available for public review. USFWS and other review comments were utilized in preparation of the BA.

The NMGS EIS addresses a Public Service Company of New Mexico (PNM) proposal to build a 2000 MW coal-fired steam electric generating station and related facilities south of Farmington, New Mexico. PNM has also proposed a land exchange with BLM known as the Ute Mountain Land Exchange, the public lands of which, if approved, would be the site of the proposed NMGS. The exchange proposal is more fully described in the BA and Ute Mountain Land Exchange EA which is included as an appendix to the BA. A possible additional end use of the public lands (hereinafter called the Bisti Lands) is a site for a Possible New Town which could house the NMGS work force and other housing needs for energy-related development. The current BA addresses the proposed NMGS and Ute Mountain Land Exchange.

A copy of the NMGS DEIS is also included as an appendix to the BA and contains a thorough description of the proposed action and alternatives. The Final NMGS EIS is scheduled for filing with the Environmental Protection Agency on July 26, 1983.

Species concerned and our determinations of effect are summarized below:

Common Name	Scientific Name	Determination of Effect
Listed		
Black-footed ferret	*Mustela nigripes*	No Effect
Bald eagle	*Haliaeetus leucocephalus*	May Affect
Peregrine falcon	*Falco peregrinus*	No Effect
Bonytail chub	*Gila elegans*	No Effect
Humpback chub	*Gila cypha*	No Effect
Greenback cutthroat trout	*Salmo clarki stomias*	May Affect
Colorado squawfish	*Ptychocheilus lucius*	No Effect
Mesa Verde cactus	*Sclerocactus mesae-verdae*	May Affect
Spineless hdgehog cactus	*Echinocereus triglochidiatus* var. *inermis*	No Effect
Knowlton cactus	*Pediocactus knowltonii*	No Effect
Candidate Animal Species		
Bluntnose shiner	*Notropis simus*	No Effect
Proposed		
None		
Candidate Plant Species		
Zuni milkvetch	*Astragalus accumbens*	No Effect
Fleabane	*Erigeron rhizomatus*	No Effect
Devil's claw cactus	*Sclerocactus whipplei* var. *heilii*	No Effect
Bladderpod	*Lesquerella pruinosa*	No Effect
Mancos milkvetch	*Astragalus humillimus*	May Affect
Annual saltbush	*Atriplex pleiantha*	No Effect

As a result of this assessment, we have determined that the only Federal-listed species that may be affected are the greenback cutthroat trout, bald eagle and the Mesa Verde cactus. However, the BLM would require (by stipulation) that project components affecting unsurveyed potential habitat (as identified by BLM or USFWS) for Mesa Verde cactus be surveyed by a qualified botanist prior to BLM issuance of our "Notice to Proceed" on rights-of-way. Should any populations be encountered, then Section 7 Consultation would immediately be reinitiated by this office.

We have also determined that the Mancos milkvetch, a Federal candidate species, may be affected by the potential for acid precipitation.

We are, therefore, requesting that formal consultation be initiated pursuant to Section 7 of the Endangered Species Act (as amended). Although the Mancos milkvetch requires no formal consultation, your recommendations for mitigation or compensation measures as solicited.

Any of the supporting documents utilized in preparation of the NMGS EIS and the BA will be made available to you on request. Your contact for this request will be Mr. John Kenny, Division of Lands and Renewable Resources, BLM New Mexico State Office (FTS 476-6231 or 6565).

Charles W. Luecker

Enclosure

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

SE

POST OFFICE BOX 1306
ALBUQUERQUE, NEW MEXICO 87103

SEP 30 1983

MEMORANDUM

TO: State Director, Bureau of Land Management, Santa Fe, New Mexico

FROM: Regional Director, Region 2 (SE)

SUBJECT: Section 7 Biological Opinion on the Proposed New Mexico Generating Station and Ute Mountain Land Exchange

This is in reply to your June 24, 1983, memorandum requesting formal Section 7 consultation, as provided by the Endangered Species Act of 1973, as amended, concerning the impact of construction and operation of the proposed New Mexico Generating Station (NMGS) and associated Ute Mountain Land Exchange on threatened and endangered species. The anticipated result of the above actions would be the establishment of a 2000-megawatt coal-fired steam electric generating station in San Juan County, New Mexico, by the Public Service Company of New Mexico.

BACKGROUND INFORMATION

This biological opinion was prepared using information from Service data and literature, the September 1981 "Final Ute Mountain Land Exchange Environmental Assessment," the November 1982 "Draft EIS on Public Service Company of New Mexico's Proposed New Mexico Generating Station and Possible New Town," the June 1983 "Biological Assessment for the New Mexico Generating Station and Ute Mountain Land Exchange Proposals," and discussions with Bureau of Land Management personnel from the New Mexico State Office. U.S. Fish and Wildlife Service personnel were also contacted from the Albuquerque Ecological Services Field Office and the Salt Lake City Endangered Species Field Station.

Ute Mountain Land Exchange involves the exchange of 17,134 acres of private land referred to as "Ute Mountain Lands" near Costilla, Taos County, New Mexico, for 7,845 acres of public lands referred to as "Bisti Lands" located about 35 miles south of Farmington, San Juan County, New Mexico. Only the surface estates of the respective lands are being considered for exchange. Ute Mountain Lands would be managed in accordance with Federal Land Policy and Management Act of 1976. Bisti Lands are proposed as the site of NMGS and associated developments such as a well field and the "Possible New Town."

"Possible New Town," would cover approximately 2,400 acres of the 7,845 acres known as Bisti Lands. The purpose of the new town would be to locate a labor force close to the planned and proposed industrial development. A feasibility study concluded that "Possible New Town" is not a viable option at this time; therefore, its description and impact has not as yet been detailed. As agreed with your staff, in the interest of expediting the formal Section 7 consultation on NMGS and the Ute Mountain Land Exchange, I will reserve my biological opinion on "Possible New Town" until such time as the development of the town is formally proposed and it is determined that its establishment may affect threatened and endangered species. Thus, this biological opinion addresses only the Ute Mountain Land Exchange and construction and operation of NMGS, including the well field. The areas of consideration for this biological opinion are lands immediately surrounding the proposed projects and areas "down wind" that might be affected by acid precipitation resulting from NMGS.

SPECIES CONSIDERATION IN CONSULTATION

Threatened and endangered species that may occur in the area of the proposed actions are black-footed ferret (Mustela nigripes), bald eagle (Haliaeetus leucocephalus), peregrine falcon (Falco peregrinus), bonytail chub (Gila elegans), humpback chub (G. cypha), greenback cutthroat trout (Salmo clarki), Colorado squawfish (Ptychocheilus lucius), Mesa Verde cactus (Sclerocactus mesae-verdae), spineless hedgehog cactus (Echinocereus triglochidiatus var. inermis), and Knowlton cactus (Pediocactus knowltonii). No proposed threatened or endangered species are known to occur in the areas of the proposed actions. Critical habitat for listed species has not been declared or proposed in the areas.

Candidate species are not protected by ESA; therefore, they will not be addressed as part of this formal consultation. When they are proposed, we can confer with you on these species in an expeditious fashion.

I agree with your findings that the bald eagle may be affected by the land exchange; the bald eagle and greenback cutthroat trout may be affected by acid precipitation from NMGS; and the bald eagle and Mesa Verde cactus may be affected by the increase in human activity in the area of the Bisti Lands. The other species discussed above either do not occur in areas to be impacted or will not be affected by the project as per the biological assessment.

The following, as presented in your June 1983 biological assessment, constitutes the biological information and the discussion of the possible effects the projects may have on these species.

Bald Eagle

Affected Environment - Bisti Lands; NMGS (all project components), Grazing Lands, Ute Mountain Lands.

The bald eagle (Haliaeetus leucocephalus) is listed as endangered by the FWS (Federal Register, May 20, 1980, pp. 33768-33781).

The southern United States population of bald eagles has suffered a decline in recent years which has been attributed to habitat loss, poisoning, and reproductive loss resulting from the use of chlorinated hydrocarbons as pesticides (Snow 1972). A historic bald eagle nest was reported near the present Navajo reservoir, prior to its construction (Hubbard et al. 1979). The breeding population in New Mexico has been historically low, and is currently thought to be nonexistent (ibid.). Bald eagles historically and presently continue to nest in Colorado in small numbers. Craig (1983) reported two active bald eagle nest sites in northwest Colorado below 7,000 feet elevation. An occupied bald eagle nest is reported (Langlois 1983) near Electra Lake, north of Durango, Colorado, at approximately 8,400 feet elevation. The lake is in the ponderosa pine zone. Two active bald eagle nest sites are known in the vicinity of Cortez, Colorado, at approximately 6,200 feet elevation (Zgainer 1982). Selection of nesting sites varies according to the species of trees growing in a particular area. The tops of tall trees, either living or dead, are generally preferred. Regardless of this variation in sites, certain general elements seem to be consistent: (1) the proximity to water (usually within a half-mile) and a clear flight path to a close point on the water, (2) the largest living tree in a span, and (3) an open view of the surrounding area. The proximity to good perching trees may also be a factor in site selection. An otherwise suitable site may not be used if there is excessive human activity in the area (FWS 1981).

The bald eagle may occur statewide in Colorado or New Mexico during migration. Pramstaller et al. (1980; unpublished) reported 134 bald eagles as being observed during the 1980 mid-winter bald eagle survey for New Mexico. Most winter observations of bald eagles in New Mexico are in association with lower-elevation lakes, reservoirs, perennial streams, and rivers which provide an adequate prey base. Some bald eagle winter use also may occur statewide, including mountainous habitat. Connor (1980) estimated 15 to 20 bald eagles wintering on upland sites (including ponderosa pine types) within the BLM Socorro Resource Area. The Navajo Game and Fish Department (Antonio 1983) has identified a small (3-5 birds) bald eagle winter area in the Chuska Mountains, west of the NMGS proposed site. The creation of Navajo reservoir (6,500 feet elevation) on the San Juan and Los Pinos Rivers resulted in the establishment of an important wintering area for bald eagles in northwest New Mexico. The periods of

winter and migration use for bald eagles in the project area is likely similar to use associated with Navajo Lake--late November to mid-April (Grubb 1979).

The bald eagle is a common winter resident along the San Juan River and its tributaries and is reported downstream and upstream from Farmington, particularly around Navajo reservoir (FWS 1981). From 18 to 25 wintering bald eagles were reported between Shiprock and Bluff, Utah, during 1978-1980. Based on winter surveys conducted by BLM (New Mexico) for the last 3 years in the general vicinity of the intake structures, the following population estimates are reported (Renwald 1983).

La Plata River-US 550 to State Line:	4 birds/year
Animas River-Aztec to State Line:	20 birds/year
San Juan River-Blanco to Navajo Dam:	6 birds/year
Navajo Reservoir:	60 birds/year

Bald eagle winter use of the larger perennial streams at lower elevations is also common in western Colorado (Craig 1983). No bald eagle roosts have been reported near any of the proposed water pipelines or intakes (Ramakka 1981).

Other than the proposed and alternative intake structures, other NMGS project components are on upland sites (NMGS site, water supply system, and transmission system) where only occasional winter and migrant use would be expected.

Below the proposed and alternative intake sites, the floodplain of the San Juan River is predominated by the "irrigated cropland and true riparian" type. Irrigated agriculture has replaced most of the riparian habitat in this area. However, the remaining sections are predominated by the Rio Grande cottonwood (Populus freemontii), willow (Salix spp.), salt cedar (Tamarix pentandra), Russian olive (Elaeagnus angustifolia), common reed (Phragmites communis), and variety of subdominant perennials and annuals (VTN Consolidated, Inc.; Museum of Northern Arizona 1978). The proposed intake location is on the southern bank of the San Juan River near Farmington. This site is on an old floodplain about 10 to 20 feet above the river level. The river is cutting into this elevated bank, thus leaving a very narrow zone of subirrigated and occasionally flooded land at the proper elevation to support riparian vegetation. This band is about 30 feet wide and is occupied by the mixed riparian scrub type, predominantly Russian olive.

The alternative intake site is upstream on the southern bank of the San Juan River near Bloomfield. The large sandbar island and a 60-foot-wide zone along the bank are covered by the mixed riparian scrub type, including sandbar willow, Russian olive, tamarisk, rabbitbrush (Chrysothammus spp.),

and cottonwood seedlings. The majority of the floodplain above the cutbank is irrigated fields with isolated large cottonwoods.

Winter use occurs on the Rio Grande in the vicinity of the Ute Mountain Lands but is light: approximately 1 bird/10 miles of river (Kuykendall 1983). Greater use occurs downstream in the vicinity of the newly constructed Cochiti Dam to White Rock (Grubb 1979). The only riparian vegetation present on the Ute Mountain Lands is along the Rio Grande. This area is the upper end of the Rio Grande Gorge which cuts through the Taos Plateau. The gorge at this point is approximately 300 feet deep. Riparian vegetation is limited to a narrow strip adjoining the river consisting of willows, tamarisk, and sedges. Important bald eagle use areas have not been documented on Ute Mountain itself or the adjoining sagebrush-grassland type.

While winds at higher altitudes of the San Juan Basin move generally from west to east, surface wind direction is greatly modified by local topography, solar insulation, and the proximity of high- and low-pressure areas (PNM 1978). There are high mountain lakes and streams in this region (northern New Mexico and Colorado) that are insufficiently protected by natural buffering and could potentially be adversely affected by acid precipitation, based on bedrock geology which is an indicator of sensitivity to acid precipitation.

The dominant vegetation types in these high mountain areas are ponderosa pine (Pinus ponderosa), lodgepole pine (Pinus cortorta), Douglas fir (Pseudotsuga menziesii), spruce-fir (Picea spp. - Abies spp.), and alpine. Riparian habitats are predominated by: narrowleaf cottonwood (Populus angustifolia), box elder (Acer negundo), willows, alder (Alnus spp.), and hawthorn (Crataegus spp.).

Environmental Consequences - As a relatively common winter resident in the vicinity of proposed and alternative intake structures, the bald eagle is often associated with San Juan River riparian habitat and depends on fish in the river as part of its prey base. No impacts to this riparian habitat or prey base are expected, as no appreciable decrease in San Juan River minimum or peak flows would occur due to proposed water withdrawal for the NMGS. Detailed discussion of this topic is contained in the Technical Reports for hydrology, vegetation, and wildlife resources (Nos. 11, 13, and 14).

For the Bloomfield alternative water supply intake site, an estimated 5 acres of riparian vegetation would be removed. For the proposed intake site (Farmington), 2 acres would be lost. There are no known bald eagle roost or nest sites on or near these sites. The loss of this riparian habitat is less than 1 percent of that in the region (2,460 acres) and is not expected to affect bald eagle use of the San Juan River.

The potential for acid precipitation effects on bald eagles is limited for the most part because the prey base near known nesting or major wintering areas would not be affected. Concentrations of bald eagles in the area of influence for the proposed project are at lower elevations, where the eagles winter in riparian habitat along major stream, lakes, or rivers. These streams have a high capacity for buffering inputs of acid and therefore would not be likely to sustain acid precipitation impacts to the bald eagle prey base (fish, waterfowl, and carrion). A limited amount of bald eagle winter uses does occur in mountainous areas of New Mexico and Colorado; however, most high-elevation open-water areas are frozen over during the winter months.

In areas that are most likely to be affected by potential acid precipitation (high mountain lakes and streams of northern New Mexico and Colorado), some losses could occur to the bald eagle prey base (fish). Recent studies (EDF 1982) have indicated that birds and mammals which prey on acid-sensitive species for food could be expected to decline if feeding lakes and streams become acidified. However, potential impacts cannot be quantified at this time. Adverse effects to aquatic ecosystems resulting from acid precipitation or dry deposition in the region have not yet been determined.

The transmission line system was considered for potential electrocution and collision effects to bald eagles. Most lines that electrocute raptors carry between 12 and 69 kV (Olendorf et al. 1981). The proposed transmission lines are 500 kV and will pose no hazard to bald eagles from electrocution because of the distance between lines. Raptor collisions are sometimes a minor problem; however, bald eagle use in the vicinity of the proposed and alternative corridors is expected to be only occasional, with no adverse effects anticipated.

However, population increases (see also discussion under Mesa Verde cactus) resulting from construction of NMGS would result in increased growth and recreational and housing demands. For example, fishing pressure on the San Juan River and Navajo Lake (an additional 15,500 fish harvested per year through the year 2000) and hunting pressures are projected. However, most of the fishing pressure occurs during the warmer months when bald eagles are not present. Most bald eagle winter use occurs around Navajo reservoir during mid-winter when recreational use is very low. Recreational use of the Animas and San Juan Rivers is limited by private access (Renwald 1983).

Greenback Cutthroat Trout

Affected Environment - Bisti Lands; NMGS - Acid Precipitation.

The greenback cutthroat trout (*Salmo clarki stomias*) is listed as an endangered subspecies by FWS (*Federal Register*, Vol. 43, No. 75, pp.

16343-16345). This subspecies inhabits clear, cold, well-oxygenated headwater streams of the South Platte and Arkansas Rivers in Colorado into which no other trout have been introduced. Other habitat characteristics include moderate gradients, abundant riparian vegetation, rocky to gravelly substrates, and cover (e.g., undercut banks, overhanging vegetation, and eddies behind instream boulders). The decline of pure populations of greenback trout has been attributed to the introduction of nonnative trout and habitat destruction. The introduction of other trout has resulted in hybridization (rainbow and yellowstone cutthroat trout) or competitive displacement (brook and brown trout). Habitat alterations, such as water diversions, logging, road building, and overgrazing have also rendered many streams unsuitable for greenback trout or other fishes.

Existing greenback cutthroat trout populations are now restricted to several headwaters streams in Colorado within their historical range. Specific waters include Black Hollow Creek, Hourglass Creek, and the South Fork of the Cache la Poudre River in Larimer County. In Boulder County, there is a population in Como Creek. The South Fork of the Huerfano Creek and Cascade Creek in Huerfano County support populations of breenback trout. Also several waters in Rocky Mountain National Park support greenback trout; they include: Bear Lake, Caddis Lake, Big Thompson River, and Hidden Valley Creek (Torres et al. 1978).

High mountain streams in Colorado are susceptible to increases in acidity. These streams lack the buffering capacity of lower-elevation streams because they usually lie in unreactive bedrock that is incapable of neutralizing the acidity of precipitation (EDF 1981). The surrounding terrain often consists of exposed bedrock of limited soil material. The bedrock of the Rockies consists mostly of sandstones and granite, which have little buffering capacity. The precipitation rate at higher altitudes is greater than at lower altitudes; therefore, there may be greater rates of total acid deposition at higher altitudes. During spring snowmelt runoff, there may be higher concentrations of acidity in a short period of time.

With respect to any impact by NMGS on these sensitive areas, two points must be addressed: (1) increases in the acidity of lakes and streams as a result of acid precipitation, and (2) NMGS contribution of SO_x and NO_x emissions to the total. There is some evidence indicating that changes in the pH levels of these lakes are the result of acid precipitation, although the evidence has been criticized. Additional baseline data are being gathered by numerous research programs, such as the National Atmospheric Deposition Program. However, it will be a number of years before enough data are collected to conclusively determine if there is a real increase in the acidity of these lakes.

An acid precipitation problem in these high mountain lakes, related to SO_x and NO_x levels, could be exacerbated if the NMGS emissions contribute

significantly to the ambient NO_x and SO_x levels in this region. However, the degree to which a contribution of NO_x and SO_x concentrations would be significant with respect to acid precipitation formation is not as yet known. In a study conducted by EPA (1979), energy related emissions were projected for the year 2000 for a three-State area (New Mexico, Utah, and Colorado). Based on these projected emissions, NMGS would contribute approximately 3 percent of this total (other potential sources include smelters and auto emissions). It is possible, however, that long-range transport from as far away as the West Coast could also have an impact on the formation of acidic rain in the high mountain lake areas of Colorado (EDF 1981). Also atmospheric conditions may not properly allow plume dispersal, significantly increasing acid precipitation along certain corridors. Thus, the figure of 3 percent may be conservative.

Environmental Consequences - If the high mountain headwater streams and lakes occupied by the greenback cutthroat trout are subjected to acid precipitation and become acidic, fishes in those waters may be affected. Low pH may inhibit larval development, affect metal concentrations, or cause fish kills. The probability of these impacts occurring and the potential magnitude of such impacts cannot be quantified at this time.

Acid-induced biological and chemical changes can progressively alter freshwater lake systems. The greatest threats to Sierra lakes are (1) loss of the already small buffering capacity, leading to chronic lake acidification, (2) toxic effects of increased acidity on organisms, and (3) indirect and synergistic toxic effects on organisims, including man, due to metals leached from watershed soils or sediment because of increasingly acid rain fall and snowmelt (Tonnessen and Harte 1982).

Mesa Verde Cactus

Affected Environment - Bisti Lands; NMGS (all project components), Grazing Lands.

Sclerocactus mesae-verdae is federally listed as threatened (44 FR 62471, October 30, 1979).

The Mesa Verde cactus is at present represented by about 20 collections in northwest New Mexico and southwest Colorado. Plants usually occur singly, but sometimes in clumps of up to 10 individuals. At present 24 populations are known to exist (Knight 1982). This cactus occurs on dry exposed hillsides of Mancos or Fruitland clays (one collection is reported from Menefee sandstone) between 4,800 to 5,500 feet elevation. This species seems to prefer gentle slopes, but can occur on steeper exposures. In the Fruitland Formation, it is often found on gentle slopes which are dotted with scattered fragments of brown iron concentrations.

It is often found with Atriplex nutallii, growing against the uphill side of this plant. It prefers soils high in selenite and may need these cracked alkaline clays for seed germination. Flowering occurs in late April and early May. The plant is uniquely adapted to eroding clay hillsides.

This species is considered threatened because of its specific habitat requirements, the high erosion rate in its habitat, its low recolonization potential, and destruction of local populations by cactus collectors (Knight 1982).

Mesa Verde cactus appears to occur consistently west of range 13 west in New Mexico. No records in the area immediately adjacent to Farmington or to the southeast are reported. Although it occurs on the Fruitland Formation, it does not occupy all of the potentially available areas in which that formation occurs. Factors other than the geologic formation may contribute to the distribution pattern of this cactus.

The Bureau of Land Management contracted to delineate the potential habitat for Mesa Verde cactus (and other T/E plants) in BLM's Chaco - San Juan Planning Area (Knight 1982). Parts of the areas identified as project components are within the Bisti Lands. Potential habitat also exists surrounding the Bisti Lands, although no populations have been discovered east of range 13 west, or south and east of Farmington, New Mexico.

Berger (1981) utilized helicopter and ground search procedures to survey 30,000 acres of public lands then being considered for the Ute Mountain Land Exchange (see Ute Mountain Land Exchange EA Map 1-5). This survey was conducted in August 1981. All potential habitat (badlands and areas of exposed heavy clay to gravelly clay soils) was searched on the ground, with no specimens of Mesa Verde cactus being found. The areas surveyed include the area under consideration for the wellfield alternative. There are differences between potential habitat areas identified by Knight (1982) and Berger (1981), but Knight feels that the PNM surveys are based on more intensive delineation of potential habitat than his effort (encompassing approximately 2 million acres) and are adequate. The Public Service Company of New Mexico has conducted additional surveys of the Bisti Lands from 1977-1982 for this plant. No specimens of Mesa Verde cactus were located.

Environmental Consequences - On the Bisti Lands potential Mesa Verde cactus habitat has been identified. Based on PNM surveys (Berger 1981; Sabo 1983c), this species has not been discovered on the public lands currently under consideration for exchange. The two possible reservoir sites contain no potential habitat.

For the pipeline and transmission line corridors, potential habitat exists on P_2 (3 miles), P_3 (15 miles), T_1 (7 miles), T_2 (4 miles), T_3 (5 miles), and T_4 (17 miles). These areas have not been surveyed. However, the applicant (Sabo 1982) has committed to conduct surveys of potential habitat of "special status" plants most likely affected by the project (see NMGS DEIS p. 1-29). Survey requirements would be included as a stipulation to BLM's ROW grant issuance. Surveys would be completed on all potential habitat not previously surveyed prior to construction and surface-disturbing activities, regardless of land status.

Mesa Verde cactus could be affected by human population increases resulting from implementing the proposed action. Total NMGS project-related labor requirements would exceed 1,600 jobs for construction and 900 for operation. The location of housing for the in-migrating employees would be the greater Farmington area. A projected 4.4 percent increase over the projected baseline population would occur in 1995 as a result of NMGS.

Increased population could result in increased pressures on Mesa Verde cactus in the form of illegal collecting, ORV use, increased demand for roads, housing, etc., that could affect known or potential habitat for this species. Impacts on Federal lands, however, would be alleviated by compliance with the ESA (e.g., ORV restrictions).

Mesa Verde cactus would not be expected to be affected by potential acid precipitation effects.

BIOLOGICAL OPINION

It is my biological opinion that the Ute Mountain Land Exchange, the projected 3 percent that NMGS might add to the total acid precipitation of the affected area, and the associated increase in the human population in San Juan County are not likely to jeopardize the continued existence of the bald eagle, greenback cutthroat trout, or Mesa Verde cactus.

Elements not considered in this consultation include "Possible New Town," effects of pipeline and transmission corridors on Mesa Verde cactus since surveys will be conducted at a later date, and acid precipitation exceeding 3 percent addition to current levels. We recommend that: (1) the effects of "Possible New Town" upon listed species be evaluated when plans are finalized for this aspect of the project; (2) effects of pipeline and transmission corridors upon Mesa Verde cactus be evaluated; (3) that monitoring activities be undertaken to ensure that acid precipitation not exceed the project 3 percent increase; and (4) that streams containing populations of greenback cutthroat trout be periodically monitored to determine if any increased acid precipitation loads are occurring.

I appreciate the cooperation you have afforded me during this consultation and offer my assistance to you in your management of listed species. Further consultation is not required unless new information becomes available that addresses the welfare of the species discussed, new threatened or endangered species are listed that may be affected by your action, or the action is subsequently modified.

cc: Director, FWS, Washington, D.C. (OES)
Director, New Mexico Department of Game and Fish, Santa Fe, NM
Area Director, Bureau of Indian Affairs, Window Rock, AZ

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1.0
INTRODUCTION AND SCOPE OF THE BIOLOGICAL ASSESSMENT

BACKGROUND

This Biological Assessment (BA) is intended to satisfy the requirements of the Endangered Species Act (ESA) of 1973, as amended, for Bureau of Land Management (BLM) authorizing actions associated with both the proposed Ute Mountain Land Exchange and New Mexico Generating Station (NMGS) and other possible end uses of the Ute Mountain Land Exchange. The two proposals are related in that the public lands (hereinafter referred to as "Bisti Lands") being considered for exchange are the same lands being considered as sites for NMGS, the Possible New Town and well field.

Negotiations between BLM and Paragon Resources, Inc. (Paragon), a subsidiary of Public Service Company of New Mexico (PNM), have been in process since 1974 for the Ute Mountain Land Exchange. The history and background of the proposed land exchange are on file (NM-30236) and available at the BLM, Albuquerque District Office. The Final Environmental Assessment (FEA) was completed in September 1981 and is included as Appendix 1 to this BA. A decision on the proposed exchange has been delayed pending completion of the Final NMGS EIS.

As of the date of this report, 17,134 acres of private land (hereinafter referred to as "Ute Mountain Lands") near Costilla, Taos County, New Mexico, are being offered in exchange for 7845 acres of public lands, about 35 miles south of Farmington, San Juan County, New Mexico. Only the surface estate of the respective tracts are being considered for exchange (mineral and water rights are excluded). Map 1-5 and 1-6 (Ute Mountain Land Exchange FEA) depict the lands currently under consideration.

The NMGS EIS addresses possible end uses of the Bisti Lands including NMGS itself, the Possible New Town (not part of the proposed action for the NMGS EIS), a well field, and livestock grazing. In response to PNM's applications to BLM for right-of-way (ROW) grants for a water supply and transmission line system, BLM was designated lead agency for the preparation of the NMGS EIS. Formal and informal cooperating agencies (see Appendix 2 - NMGS DEIS, p. 1, for a listing) were provided opportunity for early input and involvement. The 22 Technical Reports (TR) (see p. 4-10, NMGS DEIS) developed in support of the EIS were provided to cooperating agencies for review and comment. The Final EIS is scheduled for filing with the Environmental Protection Agency on July 26, 1983.

The Threatened and Endangered Species TR (No. 15) prepared by Woodward-Clyde Consultants under the direction of BLM was also used in support of the development of this BA. However, as previously discussed, the scope of the BA has been expanded to include the Ute Mountain Land Exchange. Some of the Technical Reports (e.g., Hydrology, Air Quality, and Project Description) contain more detailed information on specific components of this BA and are incorporated by reference. Copies of the reports are available at the U.S. Fish and Wildlife Service (FWS), Office of Ecological Services, in Albuquerque and other locations, as listed on pp. 4-11 through 4-14 of the NMGS DEIS.

SCOPE

This BA addresses potential effects to federal listed threatened, endangered, and candidate (category 1 and 2 plants, category 1 animals) species for federal listing from BLM and related authorizing actions (see Table 1-1 and Appendices 3 and 4). BLM has determined that PNM's application for ROWs associated with NMGS is a major federal action for which both an EIS and BA are required in compliance with the National Environmental Policy Act (NEPA) and the ESA.

The FWS, Region 2 Office (Albuquerque), was designated "lead" office between it and the Region 6 Office (Denver) as a result of potential regional effects from acid precipitation being identified in New Mexico and Colorado. The Ute Mountain Land Exchange is included in this BA to ensure ESA compliance. Species considered for the Ute Mountain Land Exchange were identified by BLM and informal contacts with FWS (Kologiski 1983).

In processing the proposed Ute Mountain Land Exchange, BLM is required to act on the formal request by Paragon Resources, Inc., in accordance with Title 43 CFR, Part 2200. Pages 1-2 through 1-4 of the Ute Mountain Land Exchange FEA describe the proposed action.

Federal authorizing actions associated with NMGS for BLM as well as other federal agencies (related actions) are presented as Table 1-1 in the NMGS DEIS. The proposed action and alternatives for NMGS are presented in Chapter 1 of that DEIS. Baseline conditions (assumed) at such time when NMGS might be constructed are described in Appendix C of the NMGS DEIS.

The scope of NMGS DEIS did address the hydrologic environmental effects of the water supply alternative involving 20,000 ac-ft/yr from the San Juan River and 15,000 ac-ft/yr from the well field. However, at the time the DEIS was developed, the surface effects of developing the well field were planned to be addressed in an EA by the Albuquerque District Office. The Final NMGS EIS and this BA will now include surface effects of the well field. A description of the development of the wellfield follows, and a layout (Map 1) appears in the Revised Information section.

Wellfield

The 16 proposed wellsites, roads and pipeline system are located approximately 35 to 45 miles south of Farmington, New Mexico. Each wellsite (330' x 660') will encompass 5 acres, totalling 80 acres for all sites. The new access roads will not exceed 20 feet in width and approximately 18,500 feet in length, totalling 8.5 acres. Thirteen of the 16 proposed roads follow existing 2-track dirt roads to within 200-300 feet of the wellsites. Five of the access roads will be constructed across undisturbed areas since there are no existing 2-track dirt roads in the immediate area of the wellsites. The collection system would be a combination gravity flow and pumped system. Approximately 29.4 miles of pipeline would be required with the ROW width being 50 feet or less affecting approximately 175 acres. The wells are to be located as follows: Number 1 in Section 9, T.23N., R.12W.; Number 2 in Section 12, T.23N., R.12W.; Number 3 in Section 24, T.23N., R.12W.; Number 4 in Section 14, T.23N., R.12W.; Number 5 in Section 26, T.23N., R.12W.; Number 6 in Section 34, T.23N., R.12W.; Number 7 in Section 21, T.23N., R.12W.; Number 8 in Section 29, T.23N., R.12W; Number 9 in Section 26, T.23N., R.13W.; Number 10 in Section 28, T.23N., R.13W.; Number 11 plus an observation well in Section 14, T.23N., R.13W.; Number 12 in Section 23, T.23N., R.13W.; Number 13 in Section 13, T.23N., R.13W.; Number 14 in Section 24, T.23N., R.13W.; Number 15 in Section 6, T.22N., R.12W.; Number 16 in Section 4, T.22N., R.12W.

Table 1-1. PROPOSED ACTIONS IDENTIFIED AS POTENTIALLY AFFECTING FEDERAL THREATENED, ENDANGERED AND CANDIDATE SPECIES AND THE CONCLUSION ON THE DETERMINATION OF EFFECT[a]

Common Name	Scientific Name	Site-NMGS	Water Supply System-NMGS	Transmission System-NMGS	Possible New Town	Grazing Lands	Ute Mountain Lands	Determination of Effect
Listed								
Black-footed ferret	Mustela nigripes	x	x	x	x	x	x	No Effect
Bald eagle	Haliaeetus leucocephalus	x	x	x	x	x	x	May Affect
Peregrine falcon	Falco peregrinus	x	x	x	x	x	x	No Effect
Bonytail chub	Gila elegans							No Effect
Humpback chub	Gila cypha							No Effect
Greenback cutthroat trout	Salmo clarki stomias							May Affect
Colorado squawfish	Ptychocheilus lucius		x					No Effect
Mesa Verde cactus	Sclerocactus mesaeverdae	x	x	x	x	x		May Affect
Spineless hedgehog cactus	Echinocereus triglochidiatus var. inermis							No Effect
Knowlton's cactus	Pediocactus knowltonii							No Effect
Candidate Animal Species								
Bluntnose shiner	Notropis simus							No Effect
Proposed								
None								
Candidate Plant Species								
Zuni milkvetch	Astragalus accumbens							No Effect
Fleabane	Erigeron rhizomatus							No Effect
Devil's claw cactus	Sclerocactus whipplei var. heilii							No Effect
Bladderpod	Lesquerella pruinosa							No Effect
Mancos milkvetch	Astragalus humillimus							May Affect
Annual saltbush	Atriplex pleiantha							No Effect

[a] The potential for acid precipitation has been identified as potentially affecting all species in this listing.

It should be stressed that the "Possible New Town" proposal is a possible end use, identified by Paragon Resources, Inc., of approximately 2400 acres of the Bisti Lands. As such, it is not a part of the NMGS proposed action, and the description and impact analysis are treated in a generalized manner. A feasibility study concluded that the New Town was not a viable possibility at this time; however, if it becomes feasible and is formally proposed, it would be subject to the full NEPA process. The end use of the remaining lands outside of NMGS (site and project components) and the Possible New Town which comprise the Bisti Lands has been proposed as grazing lands and some possible wellsites. The Ute Mountain Lands would be managed in accordance with the Federal Land Policy and Management Act of 1976. BLM's Rio Grande Planning Unit approved Management Framework Plan identified an option for BLM to "attempt to acquire Ute Mountain... for its unique natural values and the buffer area it provides to the Rio Grande wild and scenic river."

This BA is based on the best available information on both the proposed actions and environmental impacts to listed species. Under the concept of "incremental steps," it is anticipated that additional analysis and perhaps formal Section 7 consultations may be required for future federal actions related to the proposed actions based on changes to federal listed species, the proposed actions, or new information on federal listed species.

This BA is restricted to federal listed species and candidates for federal listing; however, many of the species are separately state listed as well. State listed endangered animals are discussed in the Wildlife TR (No. 11). Plant species of state concern (New Mexico Heritage Program) are discussed in the Vegetation TR (No. 13).

ORGANIZATION OF THE BIOLOGICAL ASSESSMENT

Section 2.0 of this BA is organized with the species of concern as the major heading. The Affected Environment and Environmental Consequences sections are subheadings. Only components of the proposed actions (Ute Mountain Land Exchange and NMGS) which potentially affect a species or its habitat are described. For example, Mesa Verde cactus does not occur or potentially occur on the Ute Mountain Lands and consequently receives no treatment in the assessment for those lands. Table 1-1 describes the species treated, the project component potentially affecting them, and the conclusion (determination of effect).

There are no designated critical habitats within the proposed actions' areas of influence for listed species, and consequently no discussion of critical habitat.

WILDLIFE AND AQUATIC SPECIES

Black-Footed Ferret

Affected Environment - Bisti Lands; NMGS (all project components), Possible New Town, Grazing Lands, Ute Mountain Lands.

The Black-footed ferret (Mustella nigripes) is listed as endangered throughout its range by the FWS (Federal Register;,May 20, 1980, pp. 33768-33781). The original ranges of the black-footed ferret and prairie dogs (Cynomys spp.) coincided in presettlement times. The black-footed ferret occupied almost all of the mid- and short-grass prairie region, from Saskatchewan and Alberta in the north to areas of New Mexico and Texas in the south (Gates 1973).

Most documented reports of black-footed ferrets are in or near prairie dog towns, including the recent discovery of a population in Wyoming. Potential habitat for the ferret is herein considered to be prairie dog towns.

The current status of the black-footed ferret in New Mexico is questionable. Black-footed ferrets have been reported from all but the southernmost portion of New Mexico. Most verified records in New Mexico are at least several decades old (Hubbard et al. 1979). However, the position of the Navajo Fish and Game Department (Antonio 1983) and the Bureau of Indian Affairs (BIA Navajo Area Office - Keller 1982) is that black-footed ferrets exist on the Navajo Reservation. This position is supported by reports considered reliable by the Navajo Fish and Game Department, and records considered by BIA to be "confirmed." The New Mexico Department of Game and Fish (NMDG & F) considers there to be "reliable sightings of ferrets in New Mexico in recent years" (Olson 1983).

FWS (Hansen 1981b) had considered declaring the species extinct in New Mexico, Arizona, Oklahoma, and Texas. However, the recent discovery of a population of several dozen black-footed ferrets in northwest Wyoming has spurred renewed concern for this species (Kearney 1981a, 1981b; Schroeder and Martin 1982). FWS (Stegman 1983) has no current plan to declare the species extinct in New Mexico. BLM recently contracted with the NMDG & F to attempt to determine the current status of the black-footed ferret in New Mexico. This contract is being amended with the FWS cooperating to expand on the study. There is potential for black-footed ferrets to exist in northwest New Mexico based on the continued presence of potential habitat, past physical evidence, and recent reports of black-footed ferrets.

The FWS (Woody 1982) does not consider that recent confirmed (physical or otherwise irrefutable evidence) records exist for New Mexico. BLM is in agreement with FWS on this point. The last known physical evidence of this species in the NMGS project area is in the form of documented collections as follows: Gallup-1934, Mexican Springs area-1940, and the Mount Taylor area-1918. In the area of the

Ute Mountain Lands, there was one ferret collected in the Moreno valley - Colfax County in 1929, 8 miles southwest of Santa Fe in 1930 (Dimas 1980). There have been no collections in Taos County.

The black-footed ferret has been confirmed historically in high mountain areas potentially affected by acid precipitation. The high elevation ecosystems of most western states contain little, if any, buffering capacity and are vulnerable to acid precipitation (Environmental Defense Fund 1981). The Moreno valley record in Colfax County, New Mexico, was at 8000 feet elevation; records exist for Colorado up to 10,000 feet (Armstrong 1982). In both states, most confirmed reports are at lower elevations. There have been recent unconfirmed reports of this species in Colorado (Torres et al. 1978).

PNM (Berger 1981) surveyed the 30,000 acres of Bisti Lands then being considered as part of the Ute Mountain Land Exchange for prairie dog towns (see Map 1-5, Ute Mountain Land Exchange EA, "Selected Lands"). The survey was conducted in August using low-level helicopter flights to identify prairie dog towns and on-the-ground surveying of identified prairie dog towns. The only potential black-footed ferret habitat found were four colonies of prairie dog towns in the south half of Section 3 T.22N., R.12W. The nearest project component to this area is the well field alternative: wellsite Number 16, Section 4, T.22N., R12W. There were no prairie dog towns identified on public lands (Bisti Lands) currently under consideration for exchange.

The various pipeline and transmission line routes have not been specifically surveyed for the presence of prairie dog towns. A review of existing information of the proposed and alternative pipeline and transmission line routes resulted in only P1 and T2 corridors containing prairie dog towns (Bio/West, Inc. 1982).

PNM environmental specialists surveyed (aerial and ground) the Ute Mountain Lands in October 1979 and found no evidence of prairie dog towns (Sabo 1983a). BLM's Taos Resource Area has no records of prairie dog towns for the tract, but has not conducted surveys in that area (Kuykendall 1983). However, prairie dog towns exist in similar habitat west of the Rio Grande (ibid.).

At present, neither BLM nor the FWS is requiring prairie dog or black-footed ferret surveys for linear-type projects (Steiner 1981).

The BIA Navajo Area Office recently implemented a policy which requires surveys of "threatened or endangered (T/E) species habitat" by a qualified team prior to disturbance on BIA-administered lands (Dodge 1983). Table 1-3 of the NMGS DEIS (p. 1-12) depicts land ownership for the NMGS proposed action and alternatives.

Environmental Consequences

The black-footed ferret has not recently been confirmed in high mountain areas of New Mexico and Colorado potentially affected by acid precipitation. Indirect effects to the vegetation of high mountain areas upon which prairie dogs (a primary food base of the ferret) depend were the only potential effects identified. Low-elevation habitats are expected to generally be well buffered by alkaline soils.

Potential habitat (prairie dog towns) is known for the linear project components (two prairie dog towns at MP 3-5, one at MP 38-40 for T2, and one at MP 29-31 for P1), and additional prairie dog towns may be present. The approximate total acreage of known prairie dog towns is 226 acres within the

linear corridors depicted in Appendix 1 of the NMGS DEIS. However, any disturbances which may occur to existing prairie dog towns (at such time that a final alignment is selected and construction begins) are expected to be temporary and minor, with no effects anticipated to the black-footed ferret. At this time, BLM does not plan to require black-footed ferret surveys for the pipeline or transmission line project components.

Construction of the well field would not affect any prairie dog towns.

No potential habitat currently exists on the Bisti Lands for the black-footed ferret. Acquisition of the Ute Mountain Lands is expected to have no effect on the black-footed ferret. A determination of "no effect" is made for the black-footed ferret.

Bald Eagle

Affected Environment - Bisti Lands; NMGS (all project components), Possible New Town, Grazing Lands, Ute Mountain Lands.

The bald eagle (Haliaeetus leucocephalus) is listed as endangered by the FWS (Federal Register, May 20, 1980, pp. 33768-33781).

The southern United States population of bald eagles has suffered a decline in recent years which has been attributed to habitat loss, poisoning, and reproductive loss resulting from the use of chlorinated hydrocarbons as pesticides (Snow 1972).

A historic bald eagle nest was reported near the present Navajo reservoir, prior to its construction (Hubbard et al. 1979). The breeding population in New Mexico has been historically low, and is currently thought to be nonexistent (ibid.). Bald eagles historically and presently continue to nest in Colorado in small numbers. Craig (1983) reported two active bald eagle nest sites in northwest Colorado below 7000 feet elevation. An occupied bald eagle nest is reported (Langlois 1983) near Electra Lake, north of Durango, Colorado, at approximately 8400 feet elevation. The lake is in the ponderosa pine zone. Two active bald eagle nest sites are known in the vicinity of Cortez, Colorado, at approximately 6200 feet elevation (Zgainer 1982). Selection of nesting sites varies according to the species of trees growing in a particular area. The tops of tall trees, either living or dead, are generally preferred. Regardless of this variation in sites, certain general elements seem to be consistent: (1) the proximity of water (usually within a half-mile) and a clear flight path to a close point on the water, (2) the largest living tree in a span, and (3) an open view of the surrounding area. The proximity of good perching trees may also be a factor in site selection. An otherwise suitable site may not be used if there is excessive human activity in the area (FWS 1981).

The bald eagle may occur statewide in Colorado or New Mexico during migration. Pramstaller et al. (1980; unpublished) reported 134 bald eagles as being observed during the 1980 mid-winter bald eagle survey for New Mexico. Most winter observations of bald eagles in New Mexico are in association with lower-elevation lakes, reservoirs, perennial streams, and rivers which provide an adequate prey base. Some bald eagle winter use also may occur statewide, including mountainous habitat. Connor (1980) estimated 15 to 20 bald eagles wintering on upland sites (including ponderosa pine types) within the BLM Socorro Resource Area. The Navajo Game and Fish Department (Antonio 1983) has identified a small (3-5 birds) bald eagle winter area in the Chuska Mountains, west of the NMGS proposed site. The creation of Navajo reservoir (6500 feet elevation) on the San Juan and Los Pinos rivers resulted in the

establishment of an important wintering area for bald eagles in northwest New Mexico. The periods of winter and migration use for bald eagles in the project area is likely similar to use associated with Navajo Lake-- late November to mid-April (Grubb 1979).

The bald eagle is a common winter resident along the San Juan River and its tributaries and is reported downstream and upstream from Farmington, particularly around Navajo reservoir (FWS 1981). From 18 to 25 wintering bald eagles were reported between Shiprock and Bluff, Utah, during 1978-1980. Based on winter surveys conducted by BLM (New Mexico) for the last 3 years in the general vicinity of the intake structures, the following population estimates are reported (Renwald 1983):

La Plata River-US 550 to State Line: 4 birds/year
Animas River-Aztec to State Line: 20 birds/year
San Juan River-Blanco to Navajo Dam: 6 birds/year
Navajo Reservoir: 60 birds/year

Bald eagle winter use of the larger perennial streams at lower elevations is also common in western Colorado (Craig 1983). No bald eagle roosts have been reported near any of the proposed water pipelines or intakes (Ramakka 1981).

Other than the proposed and alternative intake structures, other NMGS project components are on upland sites (NMGS site, water supply system, transmission system, and Possible New Town) where only occasional winter and migrant use would be expected.

Below the proposed and alternative intake sites, the floodplain of the San Juan River is predominated by the "irrigated cropland and true riparian" type. Irrigated agriculture has replaced most of the riparian habitat in this area. However, the remaining sections are predominated by the Rio Grande cottonwood (Populus freemontii), willow (Salix spp.), salt cedar (Tamarix pentandra), Russian olive (Elaeagnus angustifolia), common reed (Phragmites communis), and a variety of subdominant perennials and annuals (VTN Consolidated, Inc.; Museum of Northern Arizona 1978). The proposed intake location is on the southern bank of the San Juan River near Farmington. This site is on an old floodplain about 10 to 20 feet above the river level. The river is cutting into this elevated bank, thus leaving a very narrow zone of subirrigated and occasionally flooded land at the proper elevation to support riparian vegetation. This band is about 30 feet wide and is occupied by the mixed riparian scrub type, predominantly Russian olive.

The alternative intake site is upstream on the southern bank of the San Juan River near Bloomfield. The large sandbar island and a 60-foot-wide zone along the bank are covered by the mixed riparian scrub type, including sandbar willow, Russian olive, tamarisk, rabbitbrush (Chrysothammus spp.), and cottonwood seedlings. The majority of the floodplain above the cutbank is irrigated fields with isolated large cottonwoods.

Winter use occurs on the Rio Grande in the vicinity of the Ute Mountain Lands but is light: approximately 1 bird/10 miles of river (Kuykendall 1983). Greater use occurs downstream in the vicinity of the newly constructed Cochiti Dam to White Rock (Grubb 1979).

The only riparian vegetation present on the Ute Mountain Lands is along the Rio Grande. This area is the upper end of the Rio Grande Gorge which cuts through the Taos Plateau. The gorge at this point is approximately 300 feet deep.

Riparian vegetation is limited to a narrow strip adjoining the river consisting of willows, tamarisk, and sedges. Important bald eagle use areas have not been documented on Ute Mountain itself or the adjoining sagebrush - grassland type.

Figure 2-1 shows those areas in North America containing lakes that are sensitive to acid precipitation using bedrock geology as an indicator. While winds at higher altitudes of the San Juan Basin move generally from west to east, surface wind direction is greatly modified by local topography, solar insolation, and the proximity of high- and low-pressure areas (PNM 1978). There are high mountain lakes and streams in this region (northern New Mexico and Colorado) that are insufficiently protected by natural buffering and could potentially be adversely affected by acid precipitation.

The dominant vegetation types in these high mountain areas are ponderosa pine (Pinus ponderosa), lodgepole pine (Pinus cortorta), Douglas fir (Pseudotsuga menziesii), spruce-fir (Picea spp. - Abies spp.), and alpine. Riparian habitats are predominated by: narrowleaf cottonwood (Populus angustifolia), box elder (Acer negundo), willows, alder (Alnus spp.), and hawthorn (Crataegus spp.).

Environmental Consequences

As a relatively common winter resident in the vicinity of proposed and alternative intake structures, the bald eagle is often associated with San Juan River riparian habitat and depends on fish in the river as part of its prey base. No impacts to this riparian habitat or prey base are expected, as no appreciable decrease in San Juan River minimum or peak flows would occur due to proposed water withdrawal for the NMGS. Detailed discussion of this topic is contained in the Technical Reports for hydrology, vegetation, and wildlife resources (Nos. 11, 13, and 14).

For the Bloomfield alternative water supply intake site, an estimated 5 acres of riparian vegetation would be removed. For the proposed intake site (Farmington), 2 acres would be lost. There are no known bald eagle roost or nest sites on or near these sites. The loss of this riparian habitat is less than 1 percent of that in the region (2460 acres) and is not expected to affect bald eagle use of the San Juan River.

The potential for acid precipitation effects on bald eagles is limited for the most part because the prey base near known nesting or major wintering areas would not be affected. Concentrations of bald eagles in the area of influence for the proposed project are at lower elevations, where the eagles winter in riparian habitat along major stream, lakes, or rivers. These streams have a high capacity for buffering inputs of acid and therefore would not be likely to sustain acid precipitation impacts to the bald eagle prey base (fish, waterfowl, and carrion).

A limited amount of bald eagle winter uses does occur in mountainous areas of New Mexico and Colorado; however, most high-elevation open-water areas are frozen over during the winter months.

In areas that are more likely to be affected by potential acid precipitation (high mountain lakes and streams of northern New Mexico and Colorado), some losses could occur to the bald eagle prey base (fish). Recent studies (EDF 1982) have indicated that birds and mammals which prey on acid-sensitive species for food could be expected to decline if feeding lakes and streams become acidified. However, potential impacts cannot be quantified at this time. Adverse effects to aquatic ecosystems resulting from acid precipitation or dry deposition in the region have not yet been documented.

Source: Galloway et al. (1978)

Figure 2-1. REGION IN NORTH AMERICA WITH LAKES THAT MAY BE SENSITIVE TO ACID PRECIPITATION, USING BEDROCK GEOLOGY AS AN INDICATOR

The transmission line system was considered for potential electrocution and collision effects to bald eagles. Most lines that electrocute raptors carry between 12 and 69 kV (Olendorf et al. 1981). The proposed transmission lines are 500 kV, and will pose no hazard to bald eagles from electrocution. Raptor collisions are sometimes a minor problem; however, bald eagle use in the vicinity of the proposed and alternative corridors is expected to be only occasional, with no adverse effects anticipated.

Population increases (see also discussion under Mesa Verde cactus) resulting from construction of NMGS or the "Possible New Town" would result in increased growth and recreational and housing demands. For example, increased fishing pressure on the San Juan River and Navajo Lake (an additional 15,500 fish harvested per year through the year 2000) and hunting pressures are projected. However, most of the fishing pressure occurs during the warmer months when bald eagles are not present. Most bald eagle winter use occurs around Navajo reservoir during mid-winter when recreational use is very low. Recreational use of the Animas and San Juan rivers is limited by private access (Renwald 1983).

On the Ute Mountain Lands, the limited bald eagle use on the Rio Grande would be benefitted by public acquisition, which would limit the activities possible.

Limited potential adverse and beneficial impacts have been identified from acid precipitation, population increases, and acquisition of the Ute Mountain Lands, resulting in a "may affect" determination.

Peregrine Falcon

Affected Environment - Bisti Lands; NMGS (all project components), Possible New Town, Grazing Lands, Ute Mountain Lands.

The peregrine falcon is listed as endangered by the FWS (Federal Register, Vol. 35, October 13, 1970, p. 16047; Federal Register, Vol. 35, June 2, 1970, p. 8495). The principal reason for the decline of the peregrine falcon has been attributed to a bioaccumulation of persistent pesticides and their derivatives resulting in reproductive failure and possible acute and sublethal chronic poisoning (Snow 1972). Loss of habitat may be an additional problem for western United States populations.

Although habitat requirements for peregrine falcons in the Rocky Mountain region are variable, adequate nesting habitat and extensive hunting habitat are essential. In New Mexico, peregrine falcons nest on cliffs that are typically high and relatively near water. These nesting sites are generally located so that they overlook large expanses where the falcon is able to forage for passerine birds and waterfowl. As reported by Hubbard (1982), this species formerly bred in the New Mexico portion of the San Juan Basin, but there are no recent confirmed nesting records. Occasional birds are seen in migration or in winter, but there seem to be no significant areas of occupancy for the species in the area. Nesting and hunting habitats for peregrines have been documented in most of the counties in the western two-thirds of Colorado (Torres et al. 1978), including Montezuma and La Plata counties.

Air quality analysis for the proposed NMGS project has determined that there is potential for acid precipitation in high mountain lakes and streams of northern New Mexico and Colorado due to insufficient natural buffering (see discussion for bald eagles). In the vicinity of the Ute Mountain Lands, cliffs exist on the Rio Grande Gorge, which also contains riparian habitat. These cliffs are not massive and are considered marginal for peregrine nesting. Surveys (PNM 1979; Kuykendall 1983) have not identified any peregrine nesting on the tract. It is possible that the riparian habitat could be used for hunting and migrating birds.

Environmental Consequences

A small amount of riparian habitat (2-5 acres) would be lost from construction of the water supply intake, but this is not considered significant.

There are no known nests that would be affected by any construction component of the proposed project.

Although peregrine falcons occur in areas where acid precipitation may occur, nesting and foraging habitats and the prey base of the peregrine are not likely to be affected. Peregrine falcons primarily forage on passerine birds and waterfowl (Torres et al. 1978). They do not feed on fish, which would be one of the most likely groups to be affected by acid rain. Peregrine falcons could come in contact with potential acidic waters during hunting or bathing in lakes with a lowered pH. This could result in some loss of protective oils from the feathers, but generally the short time in the water would not result in any significant effects.

Acquisition of the Ute Mountain Lands may provide a degree of protection to 3 to 4 miles of potential hunting/migration habitat, but is not considered significant.

A determination of "no effect" is made for the peregrine falcon because no nests or important habitat occur in the vicinity of project components, and no impacts resulting from potential acid precipitation are anticipated.

Bonytail Chub

Affected Environment - Bisti Lands; NMGS - Acid Precipitation.

The bonytail chub (Gila elegans) is listed as endangered by FWS (Federal Register, Vol. 45, April 23, 1980, p. 27710). Historically, the bonytail chub inhabited the large warm tributaries of the Colorado River system. The bonytail has not been reported in Colorado since the 1960s; however, it still occurs in the Green River in Utah. The species has declined as a result of modification of its habitat by dam construction (FWS 1980).

Environmental Consequences

The bonytail chub does not occur in the area of any project component, and potential acid rain in western Colorado is not likely to affect habitat where bonytail chubs may exist. The large tributaries of the Colorado River system generally range in pH between 7 and 8 (Joseph et al. 1977). Point sources of acid effluents (e.g., acid mine drainage) often cause large changes in pH but are neutralized rather rapidly. These waters are also characterized by enormous sediment loads which originate from primarily alkaline soils. The conclusion is that any increase in the acidity of lakes and streams in the Colorado River drainage would have little effect on the chemical parameters of large downstream tributaries; therefore, there would be no effect on the bonytail chub.

Humpback Chub

Affected Environment - Bisti Lands; NMGS - Acid Precipitation.

The humpback chub (Gila cypha) is classified as endangered by FWS (Federal Register, Vol. 32, March 11, 1967, p. 4001). Historically, the humpback chub inhabited the large warm tributaries of the Colorado River system. Present distribution is disjunct, with humpbacks existing in widely isolated

canyons in Arizona, Utah, and the Colorado River above Grand Junction (FWS 1980). The species has declined as a result of alteration of river conditions caused by dam construction.

Environmental Consequences

None of the proposed project components would directly affect any humpback chub habitat. Since the potential for acid rain impacts is similar to that discussed for the bonytail chub, a no effect designation has been determined for the humpback.

Greenback Cutthroat Trout

Affected Environment - Bisti Lands; NMGS - Acid Precipitation.

The greenback cutthroat trout (Salmo clarki stomias) is listed as an endangered subspecies by FWS (Federal Register, Vol. 43, No. 75, pp. 16343-16345). This subspecies inhabits clear, cold, well-oxygenated headwater streams into which no other trout have been introduced. Other characteristics include moderate gradient, abundant riparian vegetation, rocky to gravelly substrates, and cover (e.g., undercut banks, overhanging vegetation, and eddies behind instream boulders). The decline of pure populations of greenback trout has been attributed to the introduction of nonnative trout and habitat destruction. The introduction of other trout has resulted in hybridization (rainbow and yellowstone cutthroat trout) or competitive displacement (brook and brown trout). Habitat alterations, such as water diversions, logging, road building, and overgrazing have also rendered many streams unsuitable for greenback trout or other fishes. Greenback cutthroat trout originally inhabited the colder waters of the South Platte and Arkansas River drainages. Existing populations are now restricted to several headwaters streams within their historical range. Specific waters include Black Hollow Creek, Hourglass Creek, and the South Fork of the Cache la Poudre River in Larimer County. In Boulder County, there is a population in Como Creek. The South Fork of the Huerfano Creek and Cascade Creek in Huerfano County support populations of greenback trout. Also several waters in Rocky Mountain National Park support greenback trout; they include: Bear Lake, Caddis Lake, Big Thompson River, and Hidden Valley Creek (Torres et al. 1978).

High mountain streams in Colorado are susceptible to increases in acidity. These streams lack the buffering capacity of lower-elevation streams because they usually lie in unreactive bedrock that is incapable of neutralizing the acidity of precipitation (EDF 1981). The surrounding terrain often consists of exposed bedrock of limited soil material. The bedrock of the Rockies consists mostly of sandstones and granite, which have little buffering capacity. The precipitation rate at higher altitudes is greater than at lower altitudes; therefore, there may be greater rates of total acid deposition at higher altitudes. During spring snowmelt runoff, there may be higher concentrations of acidity in a short period of time.

With respect to any impact by NMGS on these sensitive areas, two points must be addressed: (1) increases in the acidity of lakes and streams as a result of acid precipitation, and (2) NMGS contribution of SO_x and NO_x emissions to the total.

There is some evidence indicating that changes in the pH levels of these lakes are the result of acid precipitation, although the evidence has been criticized. Additional baseline data are being gathered by numerous research programs, such as the National Atmospheric Deposition Program. However, it will be a number of years before enough data are collected to conclusively determine if there is a real increase in the acidity of these lakes.

An acid precipitation problem in these high mountain lakes, related to SO_x and NO_x levels, could be exacerbated if the NMGS emissions contribute significantly to the ambient NO_x and SO_x levels in this region. However, the degree to which a contribution of NO_x and SO_x concentrations would be significant with respect to acid precipitation formation is not as yet known. In a study conducted by EPA (1979), energy related emissions were projected for the year 2000 for a three-state area (New Mexico, Utah and Colorado). Based on these projected emissions, NMGS would contribute approximately 3 percent of this total (other potential sources include smelters and auto emissions). It is possible, however, that long-range transport from as far away as the West Coast could also have an impact on the formation of acidic rain in the high mountain lake areas of Colorado (EDF 1981). Thus, the figure of 3 percent may be conservative.

Environmental Consequences

If the high mountain headwater streams and lakes occupied by the greenback cutthroat trout are subjected to acid precipitation and become acidic, fishes in those waters may be affected. Low pH may inhibit larval development, affect metal concentrations, or cause fish kills. The probability of these impacts occurring and the potential magnitude of such impacts cannot be quantified at this time.

Experimental studies of microcosms (laboratory simulation of natural lakes) of subalpine lakes of California's Sierra Nevada Mountains identified the following potential adverse effects from acid precipitation:

> Acid-induced biological and chemical changes can progressively alter freshwater lake systems. The greatest threats to Sierra lakes are (1)
> loss of the already small buffering capacity, leading to chronic lake acidification, (2) toxic effects of increased acidity on organisms, and (3) indirect and synergistic toxic effects on organisms, including
> man, due to metals leached from watershed soils or sediment because of increasingly acid rainfall and snowmelt (Tonnessen and Harte 1982).

Based on the assessment presented above, a may affect determination is made for this species because of the potential for acid precipitation impacts.

Colorado Squawfish

Affected Environment - Bisti Lands; NMGS - Water Supply System, Acid Precipitation.

The Colorado squawfish (Ptychocheilus lucius) is listed as federal endangered by the FWS (Federal Register, May 20, 1980, pp. 33758-33781).

Under pristine conditions the squawfish (the largest American minnow) attained a weight of up to 80 pounds and a length of 6 feet. It was a "big river" fish of the Colorado River drainage and was distributed throughout the main river channels from Wyoming to Mexico. The squawfish evolved as probably the only large piscivorous fish of the Colorado River, preying on endemic fish including the bonytail chub and the roundtail chub (Gila robusta)(Vanicek 1967; Vanicek and Dramer 1969).

The squawfish is now virtually extinct as a self-sustaining entity in the lower Colorado Basin below Glen Canyon Dam. Minckley and Deacon (1968) reported only two specimens from this area in the 1962-1967 period. Alteration of river conditions caused by dam construction and introduction of exotic

species are listed as major reasons for the species decline (FWS 1980). The species persists in the San Juan River in Utah just downstream from San Juan County, New Mexico. Populations also exist in the Green, Yampa, and Gunnison rivers of Utah and Colorado (ibid.)

The situation in the San Juan River drainage may be considered symptomatic of conditions elsewhere in the Colorado Basin. In modern times the native fauna of the San Juan Basin has been significantly reduced, both in numbers and distribution. FWS (1977) indicates that construction of Navajo reservoir (1962) had the major effect on the native fauna; the effects of the cold-water discharge extend to below Farmington. The bonytail chub is now federal endangered and the roundtail chub group is state endangered in New Mexico. Dams form a physical barrier to squawfish, which historically were migratory and moved upstream in runs to nursery areas (FWS 1981). Construction of Navajo reservoir, water depletions, and irrigation return flow have probably resulted in the extirpation of the squawfish in the vicinity of the proposed intake sites (FWS 1977).

Exotic fish introductions have undoubtedly influenced the decline of several native fish species in the Colorado River Basin. The most significant of these introductions is probably the red shiner (Minckley and Deacon 1968). It was apparently introduced in the early 1950s and spread rapidly. Population levels of this species reportedly "exploded" in Lake Powell in 1963 (Stone et al. 1965). The red shiner is known to have an omnivorous diet, which duplicated the feeding habits of young squawfish and bonytail chub, and to compete for food and space with these juvenile native fishes. The adult squawfish must compete with introduced carnivorous fish species. This is particularly true of the channel catfish since this species has become well established. Unfortunately, the same reaches of the San Juan River that are most promising for native fish reintroductions have populations of both red shiners and channel catfish (FWS 1981).

The most recent collection of squawfish in the San Juan River occurred in April 1978 near Aneth, Utah (Minckley and Carothers 1979). The most recent collection in the New Mexico portion of the San Juan River occurred near Bloomfield in 1965. No collections were reported in the San Juan River proper between 1965 and 1978 (Seethaler 1978). The squawfish taken by Minckley and Carothers near Aneth was 177 mm in length, which suggests recent reproduction in the San Juan River, since it seems unlikely that a fish of that size would move upstream from Lake Powell (Seethaler 1978). However, based on recent radio tagging experiments (FWS 1982), squawfish have been found to migrate up to 217 miles to spawn.

The New Mexico Department of Game and Fish (Hubbard et al. 1979) states that the status of the squawfish in New Mexico is now unconfirmed (since 1965), in spite of intensive surveys in the San Juan drainage in the middle and late 1970s.

The middle and lower reaches of the San Juan River downstream from Farmington have been considered as a reintroduction site for the squawfish (FWS 1978).

The San Juan River in the vicinity of the proposed and alternative intakes and downstream is characterized by perennial high turbidity, silt-laden bottom substrate, and warm water temperatures. Streamflow characteristics of the San Juan and Animas rivers are illustrated by gaging stations operated and maintained by the U.S. Geological Survey. Use of a common period of time during which representative streamflow records were collected (base period) allows comparison of the relative contributions of the Animas River and San Juan River (upstream of the Animas River) to the streamflow

in the San Juan River at the Farmington gage. The average discharge for the San Juan River near Archuleta, New Mexico, was 1321 cubic feet per second (cfs) (956,400 afy), and for the Animas River at Farmington, New Mexico, it was 810 cfs (586,400 afy), for the base period 1931-1973 (NMGS Hydrology TR). A survey was recently conducted on the San Juan River Basin from Navajo Dam to Lake Powell (VTN 1978). Fishes collected from near the alternative (Bloomfield) intake site include S. gairdneri, S. trutta, C. carpio, R. osculus, C. latipinnis, C. discobolus, C. latipinnis x C. discobolus, and F. sebrinus. Fishes collected near the proposed Farmington intake sites included the same species, excluding the C. latipinnis x C. discobolus hybrid.

Selection of the well-field alternative would involve development of up to 16 deep wells in the vicinity of the NMGS site and withdrawal of about 15,000 ac-ft/yr. The wells would tap the Westwater Canyon Member of the Morrison Formation, the most important regional aquifer in the San Juan Basin. Pumping of the well field would be expected to decrease the natural ground-water discharge to the San Juan River, Rio San Jose, Rio Puerco, and Puerco River by an estimated 0.09 cfs.

The Colorado Basin extends from the high-elevation headwaters of the Rocky Mountains to the Gulf of California; however, the squawfish does not occur in the cold water streams of the high mountain elevations potentially affected by acid precipitation. At lower elevations the soil and surface waters tend to become more alkaline. This, combined with lower precipitation, reduces the potential for acidification of surface waters occupied by the squawfish.

Environmental Consequences

Construction of a diversion intake structure at either the proposed or alternative sites would not involve construction of a diversion weir in the San Juan River which could be a barrier to squawfish (see Figure 2-2). Construction would result in a certain amount of natural aquatic substrate that would be replaced by the intake structure. Short-term localized adverse effects would also be expected from increased turbidity in the vicinity of the intake structure. Operation of the intake structure could potentially result in some impingement and entrainment of aquatic organisms. However, the water would be conveyed through trash racks and then through traveling screens into the pumping plant forebay. The traveling screen would prevent small trash particles and fish from entering the intake chamber. The squawfish is currently unconfirmed in the vicinity of the intake structures and therefore is not expected to be affected.

Withdrawal of 15,000 afy of water by development of ground water would have insignificant effects (less than 0.09 cfs reduction) on the San Juan River. Use of the proposed water supply from the Navajo reservoir would deplete the average annual supply of water in the San Juan River system in New Mexico by 35,000 afy. Diversion of this supply at the proposed intake structure or alternative intake structure would reduce the streamflow in the San Juan River downstream of the point of diversion by 48 cfs on an average basis. This depletion is not significant, since it is only 2 to 4 percent of the average annual streamflow of the river. During drought conditions when streamflow is not sufficient, PNM would have the option to call for release of an additional 48 CFS. Therefore, an additional 48 cfs may be in the San Juan river (upstream of the diversion) during drought years. Since this water would be taken in the pipeline, there would be no net change in streamflow downstream of the intake structure (see the NMGS Hydrology and Wildlife TRs for additional discussion) under drought conditions.

No effects are anticipated from potential acid precipitation on high mountain lakes and streams since they are not occupied by squawfish. Low-elevation streams are not expected to be affected.

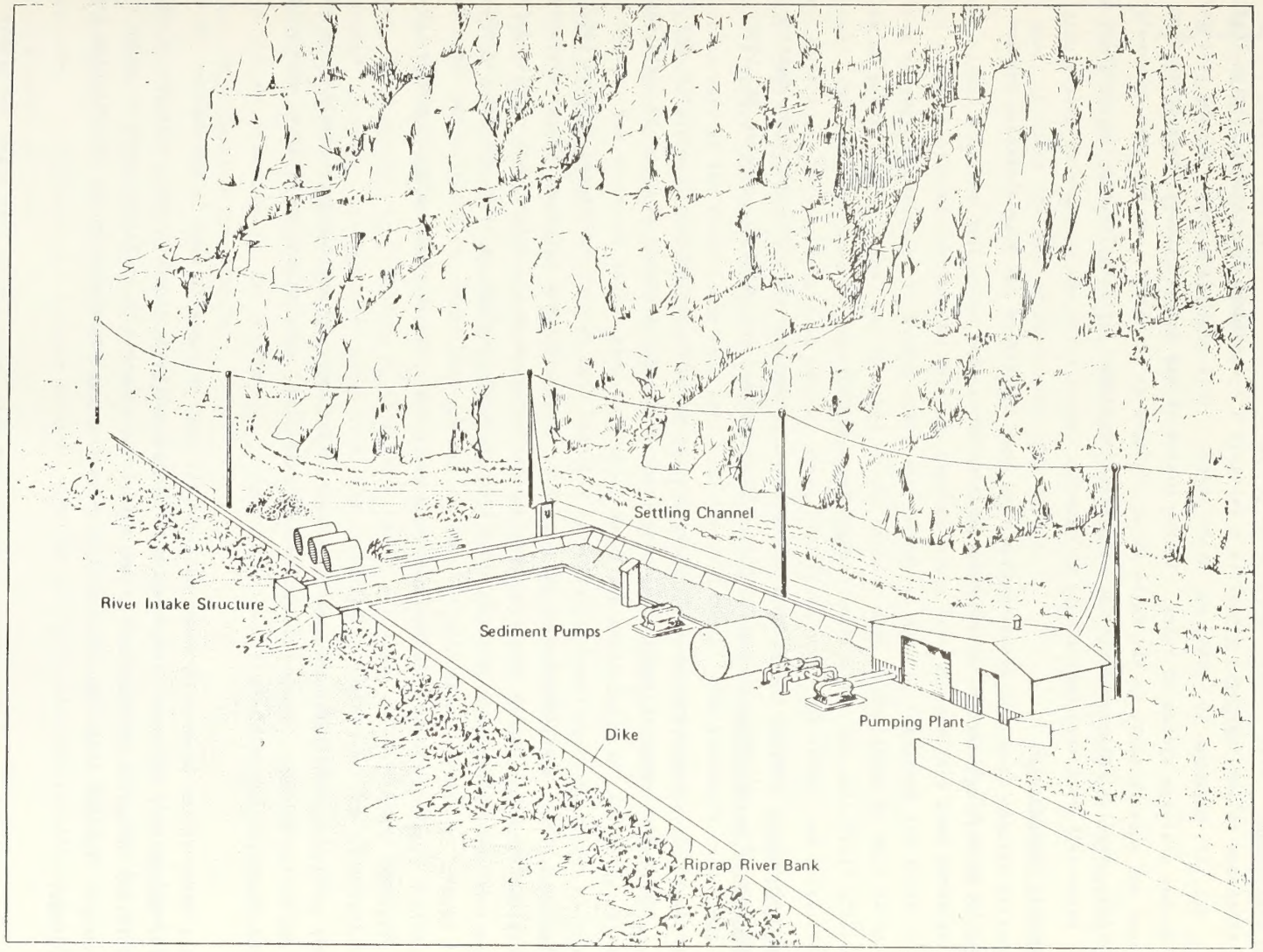

Figure 2-2. RIVER INTAKE PUMPING PLANT

Bluntnose Shiner

Affected Environment - Bisti Lands; NMGS - Acid Precipitation.

The bluntnose shiner (Notropis simus) is a category 1 - candidate for federal listing (Federal Register, Vol. 47, December 30, 1982, pp. 58454-58460). This small fish (up to 89 mm) is reported from the Rio Grande drainage system of Texas. In New Mexico it has been historically reported from near Pena Blanca and more recently in the Pecos River (Hubbard et al. 1979). It has been adversely affected by water diversions and dam construction. The areas of former distribution are low elevation.

Environmental Consequences

Potential effects from acid precipitation have been identified for high-elevation streams and lakes not occupied by this species--no effects are anticipated.

PLANTS

Mesa Verde Cactus

Affected Environment - Bisti Lands; NMGS (all project components), Possible New Town, Grazing Lands.

Sclerocactus mesae-verdae is federal listed as threatened (44 FR 62471, October 30, 1979).

The Mesa Verde cactus is at present represented by about 20 collections in northwest New Mexico and southwest Colorado. Plants usually occur singly but sometimes in clumps of up to 10 individuals. At present (Knight 1982), 24 populations are known to exist. This cactus occurs on dry exposed hillsides of Mancos or Fruitland clays (one collection is reported from Menefee sandstone) between 4800 to 5500 feet elevation. This species seems to prefer gentle slopes, but can occur on steeper exposures. In the Fruitland Formation, it is often found on gentle slopes which are dotted with scattered fragments of brown iron concretions. It is often found with Atriplex nutallii, growing against the uphill side of this plant. It prefers soils high in selenite and may need these cracked alkaline clays for seed germination. Flowering occurs in late April and early May. The plant is uniquely adapted to eroding clay hillsides.

This species is considered threatened because of its specific habitat requirements, the high erosion rate in its habitat, its low recolonization potential, and destruction of local populations by cactus collectors (Knight 1982).

Mesa Verde cactus appears to occur consistently west of range 13 west in New Mexico. No records in the area immediately adjacent to Farmington or to the southeast are reported. Although it occurs on the Fruitland Formation, it does not occupy all of the potentially available areas in which that formation occurs. Factors other than the geologic formation may contribute to the distribution pattern of this cactus.

BLM contracted to have the potential habitat for Mesa Verde cactus (and other T/E plants) in BLM's Chaco - San Juan Planning Area delineated (Knight 1982). A minimal amount of actual surveying for plants was done in conjunction with the contract. The primary purpose was the delineation of potential habitat based on preferred habitat characteristics of the species. Based on this information potential habitat has been identified for project components as follows:

P_2 (3 miles) - MP 33-35 and MP 37-NMGS (includes P_1)
P_3 (15 miles) - MP 32-NMGS
T_1 (7 miles) - MP 0-7
T_2 (4 miles) - MP 0-2 and MP 13-15
T_3 (5 miles) - MP 0-2 and MP 5-8
T_4 (17 miles) - MP 0-10 and MP 15-17

Parts of the mileages identified as project components above are within the Bisti Lands. Potential habitat also exists surrounding the Bisti Lands, although no populations have been discovered east of range 13 west, or south and east of Farmington, New Mexico.

Berger (1981) utilized helicopter and ground search procedures to survey 30,000 acres of public lands then being considered for the Ute Mountain Land Exchange (see Ute Mountain Land Exchange EA Map 1-5). This survey was conducted in August 1981. All potential habitat (badlands and areas of exposed heavy clay to gravelly clay soils) was searched on the ground, with no specimens of Mesa Verde cactus being found. The areas surveyed include the area under consideration for the well-field alternative. There are differences between potential habitat areas identified by Knight (1982) and Berger (1981). But Knight (1983) feels that the PNM surveys are based on more intensive delineation of potential habitat than his effort (encompassing approximately 2 million acres) and are adequate. PNM has conducted additional surveys of the Bisti Lands from 1977-1982 for this plant. The surveyors were Gregg Marley (former graduate student, University of New Mexico), Scott Berger, PNM Ecologist, and Dave Sabo, PNM Senior Environmental Scientist. No specimens of Mesa Verde cactus were located (Sabo 1983b).

Environmental Consequences

On the Bisti Lands potential Mesa Verde cactus habitat has been identified. Based on PNM surveys (Berger 1981; Sabo 1983c), this species has not been discovered on the public lands currently under consideration for exchange. The two possible reservoir sites contain no potential habitat.

For the pipeline and transmission line corridors, potential habitat exists on P_2 (3 miles), P_3 (15 miles), T_1 (7 miles), T_2 (4 miles), T_3 (5 miles), and T_4 (17 miles). These areas have not been surveyed. However, the applicant (Sabo 1982) has committed to conduct surveys of potential habitat of "special status" plants most likely affected by the project (see NMGS DEIS p. 1-29). Survey requirements would be included as a stipulation to BLM's ROW grant issuance. Surveys would be completed on all potential habitat not previously surveyed prior to construction and surface-disturbing activities, regardless of land status.

Mesa Verde cactus could be affected by human population increases resulting from implementing the proposed action. Total NMGS project-related labor requirements would exceed 1600 jobs for construction and 900 for operation. The location of housing for the in-migrating employees would be the greater Farmington area. A projected 4.4 percent increase over the projected baseline population would occur in 1995 as a result of NMGS.

Should the New Town be built, it could support a population of 10,000 to 12,000 over the long term (or potentially 8000 to 20,000); it would provide housing for other energy-related development (e.g., coal mining).

Increased population could result in increased pressures on Mesa Verde cactus in the form of illegal collecting, ORV use, increased demand for roads, housing, etc., that could affect known or potential habitat for this species. Impacts on federal lands, however, would be alleviated by compliance with the ESA (e.g., ORV restrictions).

Mesa Verde cactus would not be expected to be affected by potential acid precipitation effects. A discussion of these effects for all plant species considered is included at the end of this chapter.

Although no known populations would be directly affected, unsurveyed potential habitat and possible indirect impacts from population increase lead to a "may affect" conclusion.

Spineless Hedgehog Cactus

Affected Environment - Bisti Lands; NMGS - Acid Precipitation.

The spineless hedgehog cactus, Echinocereus triglochidiatus var. inermis (Schum.) Arp., is listed as endangered by the FWS (1980). Its known natural distribution is restricted to extreme eastern Utah and Mesa, Montrose, and Ouray counties in western Colorado (FWS 1978). This distribution is outside the area of project components but within the area where potential acid precipitation could occur. Suitable habitat for the spineless hedgehog cactus includes sites in partial shade under pinyon pine trees and infrequently among sagebrush on cool exposures between 5000 and 8000 feet in elevation (FWS 1978).

Environmental Consequences

A determination of "no effect" is made for the spineless hedgehog cactus because it does not occur in the vicinity of project components and no impacts resulting from potential acid precipitation are anticipated.

Knowlton's Hedgehog Cactus

Affected Environment - Bisti Lands; NMGS - Acid Precipitation

Knowlton's hedgehog cactus (Pediocactus knowltonii Benson) is listed as endangered by the FWS (1980) (Federal Register, Vol. 44, October 29, 1979, p. 62244). The known natural distribution of Knowlton's hedgehog cactus is limited to a small portion of the Los Pinos River Valley between La Boca, Colorado, and the Navajo Lake Dam in New Mexico (Knight 1982), and is therefore outside the area of project component land disturbance but within the area where potential acid rain could occur.

The species occurs on dry gravelly hills and slopes between 6000 and 7000 feet in elevation. Specific soils data are not available for the known collection sites; however, all soils in the described collection area have been derived from sandstone and shale parent materials and are alkaline, with soil pH levels between 7.4 and 8.4 (SCS 1980). The presence of calcium carbonate is variable both between soil types and within the soil profile (SCS 1980). Factors which are currently contributing to the endangerment of this species include very restricted distribution, low population levels, potential habitat modification through construction of vacation homes, removal by cactus collectors, trampling by grazing livestock, and potential inundation by increased water levels of Navajo Lake (Knight 1982).

Environmental Consequences

A determination of "no effect" is made for Knowlton's hedgehog cactus because it does not occur in the areas of project components, no impacts resulting from potential acid precipitation are anticipated, and the two known populations are relatively inaccessible to the public.

Zuni Milkvetch

Affected Environment - Bisti Lands; NMGS - Acid Precipitation

The Zuni milkvetch, Astragalus accumbens Sheld. (Leguminosae), is listed by the FWS (1980) as a category 1 status review species. The Zuni milkvetch is a New Mexico endemic, known only from west-central New Mexico from 7500 to 7900 feet. This species is usually found on gently sloping outcroppings of Chinle shale and sandstone, on clay banks and knolls in stiff dry alkaline soils derived from sandstone (Knight 1982).

Environmental Consequences

Because the Zuni milkvetch is found in a very small area distant from project components, and is restricted to a substrate apparently not found in the project area, it is not expected to occur on any project component site or rights-of-way and would therefore not be affected.

Fleabane

Affected Environment - Bisti Lands; NMGS - Acid Precipitation

Erigeron rhizomatus Cronq. is listed as a category 1 status review species by FWS (1980). It is restricted to west-central New Mexico and is known only from the Zuni and Datil mountains. It is unlikely that this taxon will be found outside of this range since it appears to be restricted to particular segments of the Chinle geologic formation of this area. This taxon is found between 7200 and 8000 feet in the pinyon-juniper ecosystem (Knight 1982). It is found on alkaline clay soils on hillsides derived from the Chinle Formation. Threats to the species are from activities associated with uranium mining, since it grows on the same geologic formation in which uranium deposits are known.

Environmental Consequences

This taxon does not occur in the vicinity of the project components, but does occur on alkaline soils in a zone outside of the high mountain areas potentially affected by acid precipitation. A determination of "no effect" is made for fleabane.

Devil's Claw Cactus

Affected Environment - Bisti Lands; NMGS - Acid Precipitation

The cactus Sclerocactus whipplei (Engelm. and Biel.) Britt. and Rose is a variable species that has been divided into several varieties. Variety Heilii Castetter, Pierce and Schwerin, is listed as a category 1 status review species by FWS (1980). Variety Heilii is found in extreme northern San Juan County, on pinyon-juniper north-facing slopes that have black sagebrush understory. It occurs on steep slopes at 6700 to 6800 feet. The Sclerocactus whipplei group is found on soil types ranging from clay to sand (Knight 1982). No plants or potential habitat are reported south of the San Juan River (Knight 1982). Cacti collectors and wood cutting have been identified as threats to this variety.

Environmental Consequences

Since none of the NMGS components are proposed in areas north of the San Juan River, the species would not be affected; therefore a determination of "no effect" is made for this cactus.

Bladderpod

Affected Environment - Bisti Lands; NMGS - Acid Precipitation

The bladderpod, Lesquerella pruinosa Greene, is listed as under review by the FWS (1980), and as a species which is probably appropriate for listing as threatened or endangered but for which insufficient biological data are available to support a proposed rule (FWS 1980). The known distribution of L. pruinosa is restricted to the vicinity of Pagosa Springs in Archuleta County, Colorado (FWS 1978). Habitat for this species is reported to include dry hills and adobe soils of dry mesas at 7000 feet elevation. Because of its small population level, the species is threatened by construction activities and use of the habitat by motorcyclists.

Environmental Consequences

A determination of "no effect" is made for the bladderpod, Lesquerella pruinosa, because it does not occur in the areas of project components and no impacts resulting from potential acid precipitation are anticipated.

Mancos Milkvetch

Affected Environment - Bisti Lands; NMGS - Acid Precipitation

The Mancos milkvetch (Astragalus humillimus Gray ex. Brand) is known to occur only on broken sandstone slopes (Mesa Verde or Pictured Cliffs) on Hogback Mountain in New Mexico between 5240 and 5320 feet in elevation (Knight 1982).

Its known soil preference is limited to deep sandy soils on ledges and flat spots, with a slight preference for 10- to 15-degree north-facing slopes (Knight 1982). Two populations of the Mancos milkvetch, both of several hundred plants, are known to occur on Hogback Mountain. Substantial effort has not yielded more collections of this species, and it is considered very rare. Knight (1982) reports that at present, there is no immediate threat of habitat destruction at the Hogback Mountain sites. Should no new populations be found, the taxon could be extinguished by an unexpected event. The distance of known populations from NMGS project activities eliminates disturbance due to construction and operation activities, other than potential acid precipitation.

Soils data are not available for Mancos milkvetch collection sites. The Cliff House Member of the Mesa Verde Sandstone Group is reported to have a $CaCO_3$ content of 1040 ppm, a HCO_3 content of 638 ppm, and pH of 7.4 (Irwin 1966). It is likely that sands derived from this or similar sandstones would have a lower pH than their parent material in surface layers, with an accumulation of carbonate (higher pH) at lower levels. Site-specific laboratory analysis of these soils is currently unavailable (Lenfeisty 1983).

McFee (1980) suggests that noncalcareous sands may be considered sensitive to acidic precipitation. This evidence suggests that soils on which the Mancos milkvetch occurs may not provide substantial buffering capacity. While current knowledge of precipitation acidity at these elevations is limited, the probability of substantial amounts occurring is low (NMGS Air Quality TR, No. 6).

Environmental Consequences

Since no relevant data now exist on the biology of the Mancos milkvetch, and there is no clear evidence that acidic precipitation which may fall would be neutralized by soil carbonates, a "may affect" determination is made.

Atriplex pleiantha, Unnamed Annual Saltbush

Affected Environment - Bisti Lands; NMGS - Acid Precipitation

Atriplex pleiantha Weber is under review by FWS (1980). It is known from southwestern Montezuma County in Colorado and in New Mexico (FWS 1978). Known habitat for this species consists of barren clay slopes of low hills at 5100 feet elevation. Existing or potential threats are unknown.

Environmental Consequences

A determination of "no effect" is made for this species because it does not occur in the areas of project components and no impacts resulting from potential acid precipitation are anticipated.

POTENTIAL ACID PRECIPITATION IMPACTS TO THREATENED OR ENDANGERED PLANTS

Although there are no current studies on the effects of acid precipitation on the plant species considered in this BA, at least two factors limit potential impacts: (1) the low mean annual rainfall and low frequency of precipitation and (2) relatively well buffered alkaline soils in the areas where acid rain could potentially occur. These two factors are typical of habitat conditions for all but one of the plant species considered.

All of the plants that occur in areas that could potentially be affected by acid precipitation are reported at relatively low elevations (5000-8000 feet). At these elevations, mean annual rainfall and the frequency of precipitation are low. As a result, exposure to acid precipitation, directly (on leaf and stem tissue) or indirectly (via the root system), would also be infrequent.

All of the plants considered in this assessment, with the exception of Mancos milkvetch, are reported from soils that are slightly basic and probably relatively well buffered. According to recent studies on acid rain effects in the Intermountain West (Environmental Defense Fund 1981), ecosystems at low elevations in the western states are relatively well buffered by alkaline soils and aerosols which neutralize atmospheric acidity carried down by precipitation. Additional studies (States 1979; EPA 1980; Wiklander 1979; McFee 1980) have indicated that the presence of carbonates and salts in soils provides a high buffering capacity against shifts in soil pH. Since carbonates are often present and pH values for soils are moderate to high in areas where the species considered in this assessment are located, it is likely that soil buffering effects would reduce potential impacts from acidic precipitation. Several of the species under consideration are generally associated with the saline, calcareous Mancos shale (Untermann and Untermann 1954).

The buffering capacity of a given soil is strongly related to its cation exchange capacity (CEC) (McFee 1980). In general, alkaline clay soils have a high CEC and low sensitivity to acidification. Noncalcareous sands with low organic matter content generally have low CEC and high sensitivity. McFee (1980) suggests that soils which lose 10 percent and 25 percent of CEC of soil after 25 years of exposure to the measured acid input should be considered slightly sensitive and sensitive, respectively. CEC data for each site supporting threatened and endangered species considered in this assessment

and experimental acidification data based on potentially affected soils are not available; therefore an assessment of soil sensitivity must be based on general knowledge of soil types. Species of concern and reported soil preference of each plant are listed in Table 2-1. With the exception of Mancos milk-vetch, none of the plants listed are generally associated with a sensitive soil type.

Findings of "no effect" or "may affect" for the plants considered in this BA are reported above under the discussion for each plant.

Table 2-1. KNOWN SOIL PREFERENCES FOR PLANT SPECIES CONSIDERED IN THE BIOLOGICAL ASSESSMENT

Taxon	Known Soil Preference
Knowlton's hedgehog cactus	Clay
Mesa verde cactus	Clay
Devil's claw cactus	Sandy loam
Annual saltbush, unnamed	Clay, Mancos shale
Spineless hedgehog cactus	Ourcrops on calcareous sandstone
Bladderpod, unnamed	Clay, Mancos shale
Zuni milkvetch	Clay
Fleabane, unnamed	Clay
Mancos milkvetch	Sandy soils

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Appendix I

WATER CONTRACT ASSIGNMENT BACKGROUND

Since the time of issuance of the DEIS Paragon Resources, Inc. (Paragon) (a wholly-owned subsidiary of PNM) and Utah International Inc. have completed an "Agreement for and Assignment of Contractual Rights to Water" (Agreement and Assignment) for consumptive use of up to 20,000 ac-ft/yr of water from Navajo Reservoir, and have submitted it to the U.S. Bureau of Reclamation for approval. The assignment, as presently proposed, includes both NMGS and coal mining as water uses. The use of this water for coal mining is specifically excluded from this document and must be covered by additional NEPA compliance prior to use of the water for that purpose. This document covers the use of this water for construction and operation of NMGS.

The EIS Proposed Action water supply source for NMGS (35,000 ac-ft/yr from Navajo Reservoir) assumed that 20,000 ac-ft/yr of water would come from assignment of Utah International's contract water. The Proposed Action further assumed that the additional 15,000 ac-ft/yr would come from a new contract from Navajo Reservoir, if available. Alternatives to the Proposed Action for this additional 15,000 ac-ft/yr were considered in detail and were: (1) 15,000 ac-ft/yr from ground water and (2) the use of a wet/dry cooling system that would preclude the need for this additional water.

With respect to the Proposed Action (a new contract for this additional 15,000 ac-ft/yr), there is uncertainty over the availability of water for making a new long-term contract for industrial use of Navajo Reservoir water. The New Mexico Interstate Stream Commission indicated that PNM would be in competition with other prospective users for any new contracts for water from Navajo Reservoir (see p. 3-24 of the Hydrology TR). As stated in a memorandum from the Acting Regional Director, Bureau of Reclamation, Salt Lake City, Utah, to the State Director Bureau of Land Management, Santa Fe, New Mexico on June 3, 1983:

> The projected water depletions for Navajo Reservoir, a participating Colorado River Storage Project (CRSP), make the proposed action of a new long-term contract for 15,000 acre-feet of water for NMGS very tenuous..... The additional 15,000 acre-feet of water could probably be acquired by a combination of alternatives such as negotiating a contract for a small amount of water, purchase of existing irrigation rights, and/or obtain [sic] a portion of the water from State approved well fields.

The Agreement and Assignment would become effective on the date that it is approved by the Contracting Officer in accordance with the contract between Utah International Inc. and the United States of America. The Contracting Officer is the Regional Director, Upper Colorado Region, Bureau of Reclamation (U.S. Department of the Interior).

The contract between Utah International Inc. and the United States (Contract No. 14-06-400-4831) was first entered into on April 11, 1968. This contract has been amended twice: one on June 11, 1975, and again on August 31, 1982. The amendatory contracts provide, among other things, for a possible extension of the term of the original contract, and permit additional time for Utah International Inc. to complete its facilities

and put the water to beneficial use. The contract and amendatory contracts permit release to Utah International Inc. from Navajo Reservoir of up to 44,000 ac-ft/yr and beneficial consumptive use of this water of up to 35,300 ac-ft/yr. The second Amendatory Contract also provides for an increasing standby water rate and a greatly increased and adjustable delivery rate, as well as requiring a water conservation plan.

Article 1(b) of the Second Amendatory Contract provides: "If the Contractor (Utah International Inc.) proposes to put the water to beneficial use other than the use described in the Final Environmental Statement for the WESCO Project, dated January 14, 1976,..., the Contractor must provide data or reports required by the Contracting Officer necessary to prepare an environmental assessment and/or an environmental impact statement describing any changed use of water as may be required to comply with the National Environmental Policy Act of 1969, ... No water shall be diverted for such different use under this contract until an appropriate environmental document has been completed and the Secretary (of the Interior) shall have confirmed in writing his determination that the applicable provisions of the National Environmental Policy Act of 1969 have been complied with and the environmental impacts of the use of water for said such different use are acceptable."

Paragon Resources Inc., and Utah International Inc., entered into their "Agreement for an Assignment of Contractual Rights to Water" on April 1, 1983. Since one of the water uses discussed in the Agreement and Assignment would be for the construction and operation of NMGS (Exhibit A of the Agreement and Assignment) and the Final Environmental Impact Statement (FEIS) on the Proposed New Mexico Generating Station was still in preparation, the Bureau of Reclamation requested that the FEIS include an analysis of the changed use of water for NMGS.

Several other provisions of the Second Amendatory Contract between Utah International Inc. and the United States, and the Agreement and Assignment between Utah International Inc., and Paragon Resources, Inc., are discussed herein, as they may affect the construction and operation of NMGS.

- The term of water service under the Second Amendatory Contract shall continue to December 31, 2005, unless an extension is approved by Congress. The Secretary of the Interior is precluded from entering into long-term contracts for the sale of water from Navajo Reservoir for industrial uses until (i) he has determined by hydrological investigation that sufficient water to fulfill the contract is reasonably likely to be available, (ii) he has submitted such determination to Congress, and (iii) Congress has approved the contract. The Secretary made such a determination with respect to the Utah International Inc. contract (up to 100,000 ac-ft/yr is available for municipal and industrial contracts from Navajo Reservoir through the year 2005), and Congress approved the contract. Should Congress extend the term for delivery of water beyond December 31, 2005, such extension will automatically apply to the Second Amendatory Contract, but in no event shall the term of the contract exceed 40 years from the date of the Second Amendatory Contract (August 31, 2022). In the event of such an extension and if water were available, Utah International Inc. or Paragon would be required to enter into a new contract with the United States for water service after August 31, 2022. There is no provision in the amended contract for preferential treatment for Utah International Inc., nor any provision for renewal.

- Article 5 of the Agreement and Assignment states that Paragon Resources Inc. agrees to observe each and every term and condition of the water contracts (between Utah International Inc. and the United States), including but not limited to the provisions of the Second Amendatory Contract "regarding Indian Employment, Equal Opportunity, Title VI Civil Rights,

Water Conservation Programs, and Rules, Regulations and Determinations." In particular, Articles 4 and 5 of the Second Amendatory Contract provide that the Contractor or their assignees give preference for employment to qualified Indians for work on or near an Indian Reservation, and Article 6 of the Second Amendatory Contract provides that the Contractor shall develop and implement an effective water conservation program for all uses of the water delivered under the contract.

The Jicarilla Apache Tribe filed suit on November 12, 1982 to declare the Second Amendatory Contract between Utah International Inc. and the United States void and of no effect (Jacarilla Apache Tribe v. United States of America, et al. Civil No. 82 1327 M, U.S. District Court for the District of New Mexico). The Jicarilla Apache Tribe claims rights under the "Winters' Doctrine" to use of the waters of the Navajo River (tributary to San Juan River) and its tributaries as is or may be necessary to satisfy the present and future needs of the Tribe. A general water adjudication of the San Juan River Basin in New Mexico is also proceeding at present (State of New Mexico ex rel. State Engineer v. United States of America et al. Civil No. 75-184, District Court of San Juan County, New Mexico), in which the water rights claims of the Jicarilla Apache, Navajo, Ute Mountain Ute Tribe and other non-Indian defendants will be decided. Resolution of the controversies over ownership of water rights in the San Juan River Basin, and of the water adjudication and declaratory judgment suits in particular, are outside of the scope of the EIS. These legal actions concerning ownership of the water rights in the San Juan Basin are presented to acquaint the reader with potential conflicts with use of water for NMGS.

Appendix J

UTE MOUNTAIN LAND EXCHANGE
ENVIRONMENTAL ASSESSMENT

FINAL

UTE MOUNTAIN LAND EXCHANGE ENVIRONMENTAL ASSESSMENT

SEPTEMBER 1981

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
ALBUQUERQUE DISTRICT OFFICE
ALBUQUERQUE, NEW MEXICO

DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

FINAL
UTE MOUNTAIN LAND EXCHANGE
ENVIRONMENTAL ASSESSMENT

Type of Action: (x) Administrative ( ) Legislative

Abstract: Paragon Resources, Inc. (Paragon) proposes to exchange 17,138 acres of private land located north of Questa, New Mexico in Taos County for 8,000 to 9,600 acres of public land located north and south of the Chaco Culture National Historical Park in San Juan and McKinley Counties. The exchange would result in a loss of control and management of the land and resource components by the Bureau of Land Management (BLM) for lands taken out of federal ownership. Land and resource components acquired by the BLM would be placed under federal control and management. The Proposed Action and a No Action Alternative are considered. A discussion of the resource values, affected environment and the environmental consequences resulting from the Proposed Action are documented in this environmental assessment (EA).

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Comments have been requested from: See Chapter 4.

L. Paul Applegate
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PREFACE

There are seven separate but interrelated projects proposed for public lands in the San Juan Basin. Of these proposals, the Ute Mountain Land Exchange Environmental Assessment (EA) is the second proposal that has undergone environmental analysis and consideration. The type of environmental document to be prepared for the other proposals is listed below.

Project	Environmental Document
Coal Preference Right Leasing New Mexico	EA
Ute Mountain Land Exchange	EA
Bisti Badlands Coal Lease Exchange	EA
Accelerated Wilderness Study Area	EIS
San Juan River Regional Coal Leasing	EIS
New Mexico Generating Station	EIS
Bisti Multiple Resource Program	EA

A cumulative overview will also be prepared to analyze the cumulative impacts projected to occur from these proposals. The overview will be provided as a supplement to each of the EISs and is scheduled to be completed April 1983.

Paragon Resources, Inc., (Paragon) a subsidiary of Public Service Company of New Mexico, has purchased Franklin Land and Resources, Inc's 50 percent interest in the private lands offered for exchange. Paragon is now the only company involved with this exchange proposal and is, therefore, the only company referenced in this Final Environmental Assessment (FEA).

chapter 1

DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

CHAPTER 1

DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVE

SCOPE OF THE ENVIRONMENTAL ASSESSMENT (EA)

This EA will analyze the impacts that would occur from a loss or gain of BLM control and management of lands involved in this exchange. The analysis of uses that could occur on lands acquired by the BLM are projected uses. Specific land uses (types, location, combination) would be determined through the Bureau's resource management plans.

Uses proposed by Paragon may or may not occur on lands acquired in an exchange; therefore, the identification and analysis of actions proposed for lands acquired by Paragon are not addressed in this EA. The proposed New Mexico Generation Station (NMGS), townsite and related facilities will be analyzed in a separate environmental impact statement (EIS).

This EA discusses the resource values which could be either acquired or lost by BLM through the proposed land exchange.

PURPOSE OF AND NEED FOR THE PROPOSED ACTION

The purpose of the Proposed Action is to change ownership and management of public lands located north and south of the Chaco Culture National Historical Park in San Juan and McKinley Counties with private lands located north of Questa, New Mexico, in Taos County. The BLM would acquire Ute Mountain, as well as lands east of the Rio Grande Wild and Scenic River. This could result in acquiring a potential Wilderness Study Area (WSA), wildlife habitat for game and non-game species, and lands that would provide additional recreational opportunities. Paragon could acquire land for a proposed coal-fired generation station, townsite, and enlargement of land and water holdings near Bisti, New Mexico in San Juan County and in McKinley County.

HISTORY AND BACKGROUND

Offered and Selected Lands

Negotiations on this proposed land exchange have been in process since 1974. The history and background of this proposal is on file and available for public inspection at the BLM Albuquerque District Office.

Scenic Easement

On October 2, 1968, the Rio Grande from the "...Colorado State Line downstream to the State Highway 96 crossing..." was designated by Congress as a Wild and Scenic River under the Wild and Scenic Rivers Act (Public Law 90-542). In accordance with this Act, the BLM sought a buffer zone to protect the values of the Rio Grande and to prevent any developments or changes that would detract from the Wild River area.

In September 1979, Paragon agreed to convey a scenic easement to the BLM on approximately 700 acres of land along the Rio Grande Wild and Scenic River. The easement was conveyed to the BLM on March 14, 1980. Paragon continues to own the land, while the BLM controls activities therein on a quarter-mile wide stretch of land along the river. (A copy of the Scenic Easement Agreement is on file in the BLM Albuquerque District Office.)

DESCRIPTION OF THE PROPOSED ACTION AND THE NO ACTION ALTERNATIVE

Proposed Action

Paragon is proposing to exchange approximately 17,138 acres of private land for public land near Bisti, New Mexico. The amount of public land considered for exchange originally was approximately 29,952 acres. Of this amount, approximately 2,237 acres in T. 24 N., R. 11 W. ($S^1/2$ of Section 34 and all of Section 35) and T. 23 N., R. 11 W. (Sections 2 and 3) have been dropped from the exchange. Therefore, the total amount of public land being considered for exchange is 27,715 acres. Of the 27,715 acre amount, between 8,000 to 9,600 acres of public land could be exchanged for private land. Based on preliminary appraisal of the current market value of the public lands, the 8,000 to 9,600-acre figure is the approximate amount of land that would be equal in value to the 17,138 acres of private land. Map 1-1 shows the location of the public and private lands being considered for exchange. The legal description for both tracts of land is in Appendices A-1 and A-2.

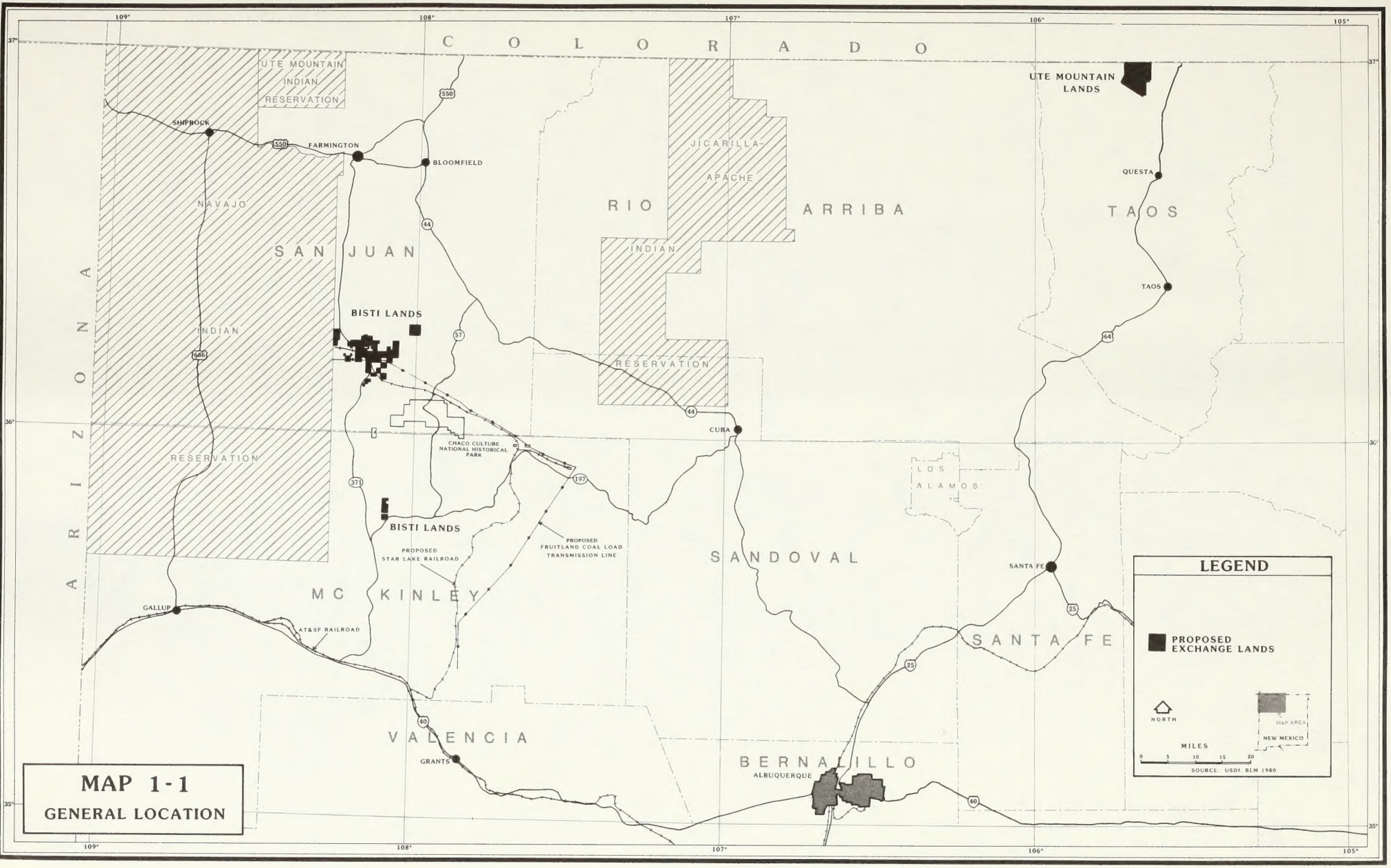
For ease in discussing the public lands proposed for exchange by Paragon, they will be referred to as "the Bisti Lands" in this EA. Map 1-2 shows the land status of the Bisti Lands. Similarly, the private lands proposed for exchange by Paragon will be referred to as "the Ute Mountain Lands". Map 1-3 shows the topography and location of the Ute Mountain Lands, and Map 1-4 shows the land status of Ute Mountain and adjacent lands.

This proposed exchange is only for the surface estate of both the public and private lands. The surface estate of land under a Scenic Easement Agreement would be acquired in this exchange. The restrictions of the agreement on surface disturbance for mining activities by Paragon would still apply after the exchange.

Access to 1.6 sections of the Fossil Forest (T. 23 N., R. 12 W. Section 13, $W^1/2$; Section 14, $S^1/2$; Section 23, $NE^1/4$, $N^1/2SE^1/4$; and Section 24, $NW^1/4$) will be made available to BLM or a designated representative for up to 10 years from the completion date of the Management Framework Plan (MFP), for paleontological study and salvage operations. Salvaged materials will remain the property of BLM or its designated representative.

The minerals of the Bisti Lands will be retained by the BLM. The Preference Right Lease Applicants (PRLAs) can develop their leases on the surface and subsurface of any exchange lands that Paragon might acquire in the proposed exchange (See Appendix A-3). The minerals of the Ute Mountain Lands will be retained by Paragon, Mr. A. K. McMillan, and Rio Costilla Livestock Association.

Two BLM livestock wells could be lost with Bisti Lands in this exchange. There are no wells or water developments on the Ute Mountain Lands.



MAP 1-1
GENERAL LOCATION

There will also be consultation with the State Historic Preservation Officer (SHPO) on the historic value of the Tanner Lake Way Station. A maximum of 42.07 acres of public land, with the remaining structures of the way station, may be excluded from the proposed exchange.

Specific resource management programs on the Bisti Lands, as analyzed in this EA, could be terminated by an exchange, or altered on areas located adjacent to the Bisti Lands. Resource management programs as determined by this EA and the BLM planning system would be instituted on the Ute Mountain Lands.

No Action Alternative

Under the provisions of Title 43 of the Code of Federal Regulations (CFR), Part 2200, the BLM is required to act on the formal request for a land exchange by Paragon. Therefore, the No Action Alternative would be to reject Paragon's formal request.

An application may be rejected if the Secretary of the Interior determines that "...the public interest will (not) be well served by making that exchange." Additionally, "...when considering public interest the Secretary concerned shall give full consideration to better Federal land management and the needs of State and local people, including needs for lands for the economy, community expansion, recreation areas, food, fiber, minerals, and fish and wildlife and the Secretary concerned finds that the values and the objectives which Federal lands or interests to be conveyed may serve if retained in Federal ownership are not more than the values of the non-Federal lands or interests and the public objectives they could serve if acquired" (Section 206 (a) of the Federal Land Policy and Management Act of 1976)(FLPMA).

ALTERNATIVES NOT ANALYZED IN THE EA

Paragon may also apply for the Bisti Lands through sale, right-of-way permit, or an exchange application for less acreage. These alternatives would not satisfy the same purpose and need of the BLM to acquire 17,138 acres of the Ute Mountain Lands. Therefore, these alternatives are not analyzed in this EA.

AUTHORIZING ACTIONS

Passage of FLPMA established new policy for land exchanges. The final regulations (Exchange Procedures for Public Lands) implementing FLPMA were issued on January 6, 1981. Under these regulations, the action required to authorize a transfer of ownership of public lands is approval of the proposed action by the District Manager. A decision by the Secretary of the Interior would be required only if the decision were protested. Approval by the District Manager or, if required, the Secretary of the Interior would result in the issuance of a patent. Paragon would be required to convey to BLM's authorized officer the warranty deed or other documents of conveyance which meet the Department of Justice title standards 2201.5(6) on private lands.

INTERRELATIONSHIPS WITH EXISTING ENVIRONMENTAL DATA

Land Use Plan

The Albuquerque District staff completed a land use plan for the Rio Grande Planning Unit in April 1979. The approved MFP for the Rio Grande

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

ALBUQUERQUE DISTRICT OFFICE
ALBUQUERQUE, NEW MEXICO

UTE MOUNTAIN EXCHANGE
ENVIRONMENTAL ASSESSMENT

BISTI LANDS
MAP 1-2

R. 13 W. R. 12 W. R. 11 W. R. 10 W.

T. 24 N.

T. 23 N.

T. 22 N.

RESERVATION

INDIAN

NAVAJO

BISTI TRADING POST

Hunter Wash

Wash

Alamo Wash

Coal Creek

De-Na-Zin Wash

Chaco Wash

371

57

LEGEND

LAND STATUS

- SELECTED LAND
- INDIAN WITHDRAWAL
- PUBLIC
- INDIAN
- PRIVATE
- STATE

NORTH

1 0 1 2 3 MILES

SCALE: 1:126,720

T. 18 N.

R.12W.

SEPTEMBER 1981

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

ALBUQUERQUE DISTRICT OFFICE
ALBUQUERQUE, NEW MEXICO

UTE MOUNTAIN EXCHANGE
ENVIRONMENTAL ASSESSMENT

UTE MOUNTAIN LANDS
MAP 1-3

R.9 E. R.10 E. R.11 E. R.12 E. R.13 E.

T. 31 N.

T. 30 N.

T. 29 N.

COLORADO

COSTILLO

TOP 'O THE WORLD FARMS

Ute Mountain

SUNSHINE VALLEY

BUENA VISTA

CERRO

Cerro de la Olla

Rio Grande

285

3

LEGEND

TOPOGRAPHY

OFFERED LAND

NORTH

SCALE: 1:126,720

1 0 1 2 3 MILES

CONTOUR INTERVAL - 20 METERS

SEPTEMBER 1981

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

ALBUQUERQUE DISTRICT OFFICE
ALBUQUERQUE, NEW MEXICO

UTE MOUNTAIN EXCHANGE
ENVIRONMENTAL ASSESSMENT

UTE MOUNTAIN LANDS
MAP 1-4

R.9 E. R.10 E. R.11 E. R.12 E. R.13 E.

T. 31 N.

T. 30 N.

T. 29 N.

COLORADO

COSTILLO

TOP 'O THE WORLD FARMS

Ute Mountain

SUNSHINE VALLEY

BUENA VISTA

CERRO

Cerro de la Olla

285

3

LEGEND

LAND STATUS

- OFFERED LAND
- FOREST SERVICE
- PUBLIC
- STATE
- PRIVATE
- WITHDRAWAL

SCALE: 1:126,720

1 0 1 2 3 MILES

NORTH

SEPTEMBER 1981

Planning Unit requires the BLM to "Attempt to acquire Ute Mountain...for its unique natural values and the buffer area it provides to the Rio Grande Wild and Scenic River." The reason for acquiring this land is to "...provide for better protective management of the Wild and Scenic River."

The Albuquerque District Staff has completed the update for the land use plan (MFP) for the Chaco Planning Unit. Land use decisions have been made for public lands being considered in this exchange. The decision for Lands Recommendation L-2.1 was to make lands available for consideration in the Ute Mountain Land Exchange. Two priorities were made in the public lands to be selected for exchange by BLM. Priority A lands are those lands in Paragon's Tsaya and Black Lake allotments, which includes the Fossil Forest. The planning decision for the Fossil Forest is presented in the proposed action.

Also included in the priority A lands are the Crane Petroglyphs and a gathering site and Tanner Lake Battlefield. Further consideration, through environmental analysis and consultation with the SHPO, will be made to determine if the Crane Petroglyphs should be salvaged prior to exchange. The planning decision for the Tanner Lake Way Station is presented in the proposed action.

Priority B lands are the remaining lands that are being considered in the proposed exchange (i.e. Navajo livestock allotments, a sacred site, etc.). 2,237 acres in T. 23 and 24 N., R. 11 W. have been excluded from the lands which would be available in the exchange. This acreage was excluded because of other land use considerations for coal. A portion of the lands in the exchange which had been recommended for ACEC designation for paleontological, recreation, and visual resources were not included in the designated Bisti/De-na-zin ACEC.

San Juan County does not address the Bisti Lands in its land use plan.

Feasibility Study

A feasibility study on the proposed Ute Mountain Land Exchange has been prepared by the BLM Albuquerque District's Taos Resource Area staff (September 1980). The study was written to add insight to the feasibility of this proposed exchange and to identify alternatives. A copy of the feasibility study is on file and available for public inspection at the BLM Albuquerque District Office.

Environmental Assessment for Coal Preference Right Leasing New Mexico

A draft EA was released in June 1981 for the Preference Right Lease Applications (PRLAs). These PRLAs are existing lease applications, most of them dating from the early 1970's, which had been deferred pending the development of the federal coal program regulations. Some of the resource impacts and values discussed in the Ute Mountain Land Exchange EA will be impacted by coal mining. The PRLA EA analyzes the effects of coal mining on public lands within the PRLAs, which includes approximately 7,379 acres of the Bisti Lands in the Ute Mountain Land Exchange. Map 1-5 shows the overlap of the Bisti Lands with the PRLAs.

Environmental Assessment Record on Proposed Navajo Land Exchange

An EA was prepared in 1978 for the "...proposed land exchange between the Navajo Tribe and the BLM for approximately 57,000 acres of public lands located south of Farmington, New Mexico for 80,000 acres of private lands located in the Ladron and Malpais areas south of Grants, New Mexico" (BLM, 1978). The 1978 EA was used in determining the overlap of lands being considered in both the Navajo Exchange and the proposed Ute Mountain Land Exchange. A mitigating measure in the Navajo Land Exchange specified that Navajo families located on or adjacent to strippable coal would not be included in this exchange.

Of the seven tracts occupied by Navajo families on both the Navajo and Ute Mountain Land Exchanges, three of the tracts are on lands that have been leased for coal development. Two other tracts have been leased, except for approximately 80 and 40 acres of land which are in an outstanding coal lease application. The remaining two tracts are not leased for coal development but are under a 20-year withdrawal, pending completion of the Navajo Land Exchange (i.e. legislation to place the public lands in trust status for the Navajo tribe). Once the Navajo Land Exchange is completed, the withdrawal would be removed. The mitigation measure in the Navajo Land Exchange EA of not exchanging public lands on or adjacent to areas valuable for strippable coal would apply to the last two tracts. Map 1-5 shows the location of the Indian families on the coal lease, competitive lease application, and potential competitive coal lease areas.

SUMMARY OF RESOURCE VALUES AND IMPACTS

Table 1-1 summarizes the resource values for the Bisti and Ute Mountain Lands, as presented in Chapter 2. Table 1-2 and Map 1-5 summarizes the resource impacts that could occur in a land exchange. This EA analyzes only the unmitigated impacts, which would be a loss of the affected resource. Mitigation measures and residual impacts are, therefore, not included in this table or Chapter 3, environmental consequences. Management options, available to the decision-maker when a decision is made, are included in Table 1-2. Table 1-3 lists the standard operating procedures of resource components as required by law.

TABLE 1-1

SUMMARY OF RESOURCE VALUES

Bisti Lands	Ute Mountain Lands[a/]
Paleontological Resources	Paleontological Resources
There are 5 Class I (Critical), 44 Class II (Highly Important), 155 Class III (Important), 296 Class IV (Not Important) fossil sites.	
Minerals	Minerals
Strippable and underground coal present.	The USGS indicates that the Ute Mountain Lands are "without value" for locatable or leasable minerals.
Coal leases in the Bisti WSA will be exchanged for a portion of 2,640 acres of coal (identified in P.L. 96-475). The leases in the Bisti WSA are held by Sunbelt Mining Co.	
Paragon holds 879 mining claims on the Bisti North Lands.	
Phillips Uranium holds 140 mining claims on the Bisti South Lands.	
48 oil and gas leases.	
Deposits of sand, gravel, and humates are present.	Deposits of sand and gravel are present.
Mineral (subsurface) rights would remain in federal ownership and management. The public would be allowed to continue to explore, stake claims and apply for leases, and develop claims and leases for federal minerals under private land.	Mineral (subsurface) rights would remain in private ownership by Paragon, Mr. A.K. McMillan, and Rio Costilla Cooperative Livestock Association, who would be allowed to explore and develop minerals.
Access for the public to explore and develop future federal mining claims and oil and gas leases on private land is guaranteed by the BLM.	Access to explore and develop minerals is guaranteed to Paragon and Mr. A.K. McMillan.
	A scenic easement agreement between Paragon and BLM restricts actions by the company on a quarter-mile stretch of land along the Rio Grande Wild and Scenic River. Mr. A.K. McMillan has access to land along the river.
Water Resources	Water Resources
Approximately 1,500 acres of floodplains have been identified.	
Six USGS observation wells and three stockwater wells exist (2 stockwater wells are owned by BLM, and 1 by Paragon).	
Poor quality surface water and fair to poor quality ground water, at low yields, is present.	

TABLE 1-1 (continued)

Bisti Lands	Ute Mountain Lands[a/]
Social and Economic Factors[b/]	Social and Economic Factors[b/]
The Bisti Lands are used by the Navajo in collecting herbs and sandstone.	
Ten apparent Navajo burial sites, one sacred and gathering site, and an unknown number of religious sites are located on the Bisti Lands.	
	Increase in county revenue from in-lieu tax payments by the federal government.
Livestock Grazing	Livestock Grazing
Nine Indian operators graze livestock.	On the Ute Mountain Lands, 8,160 acres (62%) of vegetation is in poor condition; 3,537 acres (27%) and 1,362 acres (11%) are in fair and good condition respectively.
Phillips Uranium holds a grazing lease on the Bisti South Lands.	
Portions of two grazing allotments, totaling 17,635 acres, are held by Paragon.	
Range condition is not known for the vegetation on the Bisti Lands.	
Cultural Resources	Cultural Resources
Inventories have been conducted on 11,352 acres. Lithic and Archaic sites comprise 57 percent of the known sites. Anasazi sites represent 7 percent of the known sites. Navajo sites could total 36 percent of the known sites.	Seven sites identified (2 undiagnostic lithic scatters, 1 late prehistoric/early historic habitation site, 4 historic sites).
Wilderness	Wilderness
Three wilderness study areas (WSAs) are located adjacent to the Bisti Lands. The three WSAs (Bisti, De-na-zin, and Ah-shi-sle-pah) are of an ecotype sparsely represented in the National Wilderness Preservation System.	Preliminary determinations indicate that the Ute Mountain Lands may qualify for a WSA designation. The WSA would be of an ecotype that is well represented in the National Wilderness Preservation System.
Recreation	Recreation
A recreational ACEC has been designated in the BLM's planning update for the Chaco MFP. This ACEC includes the boundaries of the Bisti and De-na-zin WSAs.	
Recreation opportunities such as sightseeing, ORV, hiking, and rock collecting occur.	Backpacking, hiking, ORV, sightseeing, rock collecting, and cross country skiing are recreational opportunities that could occur on the Ute Mountain Lands under federal ownership.
Wildlife	Wildlife
The bald eagle (endangered), peregrine falcon (endangered), and the black-footed ferret (endangered) are federal and state listed species that may occur.	The same federal listed species as for the Bisti Lands may occur on the Ute Mountain Lands. In addition the state listed species include the three federal species and the western toad (Group II), marten (Group II), and mink (Group II).

TABLE 1-1 (concluded)

Bisti Lands	Ute Mountain Lands[a/]
Wildlife (cont'd)	Wildlife (cont'd)
The Bisti Lands are not within an officially designated New Mexico Department of Game and Fish herd unit.	Less than 1 percent of the Ute Mountain Lands are in each of 3 herd units (Sangre de Cristo Deer Herd Unit, Maxwell Elk Herd Unit, or Tres Piedras Antelope Herd Unit).
Habitat is of the plains grassland biome.	Habitat is comprised of portions of four diverse biomes: petran sub-alpine conifer forest and woodland; Great Basin conifer woodland; plains grassland; and Great Basin desert shrub.
Species diversity is composed of approximately 34 species of mammals, 72 species of birds, 12 species of reptiles, and 6 species of amphibians.	Species diversity is composed of approximately 60 species of mammals, 172 species of birds, 16 species of reptiles, 7 species of amphibians, and 13 species of fish.
Land Uses	Land Uses
Right-of-way (ROW) permits have been granted for transmission lines, roads, a railroad, meteorological sites, and observation wells.	
Visual Resources	Visual Resources
Class A scenic values have been identified for the Bisti Lands located East and West of the Bisti WSA and south-southwest of the De-na-zin WSA.	

Notes: [a/] Environmental components not discussed under Ute Mountain Lands do not occur on them.
[b/] Socioeconomic information is listed throughout the table, as it relates to the other resources.

TABLE 1-2

SUMMARY OF RESOURCE IMPACTS

Resource Impacts		Management Options	
Bisti Lands	Ute Mountain Lands	Bisti Lands	Ute Mountain Lands
Paleontological Resources			
Portions of 5 sections with Class I paleontological sites could be lost from public access and federal management.			
Minerals		Minerals	
Through BLM planning 4,800 acres of underground coal and 2,560 acres of potential surface mining areas could be considered for competitive coal leasing. Private surface ownership could influence bidding in a competitive lease or development of the lease by the lessee.		A decision on exchanging lands in the exchange that may be leased through competitive leasing could be delayed until a competitive lease(s) is issued.	
A portion of the lands listed for selection in P.L. 96-475 for the Coal Lease Exchange would be acquired by the Sunbelt Mining Company. Lands remaining from the exchange could be eligible for competitive leasing under other federal laws and regulations.		A decision on exchanging the Bisti Lands (approximately 2,640 acres) could be delayed until the Coal Lease Exchange is completed or until a competitive lease is issued.	
Surface disturbance could occur on private land in the development of Preference Right Leases. Section 209 of FLPMA [a] does not provide for reimbursement to the surface owner for damages due to mineral entry.			
Surface disturbance could occur on private land in the development of 48 oil and gas leases and 140 mining claims. Section 209 of FLPMA does not provide for reimbursement to the surface owner for damages due to mineral entry.			

TABLE 1-2 (continued)

Resource Impacts		Management Options	
Bisti Lands	Ute Mountain Lands	Bisti Lands	Ute Mountain Lands
Minerals (Cont'd)			
If Phillips Uranium patents the surface estate of any of the 140 mining claims, Paragon could lose up to 2,009 acres of the surface estate of these lands if acquired in the proposed exchange.			
Surface disturbance to private lands would occur during future exploration and development of federal minerals. Section 209 of FLPMA does not provide for reimbursement to the surface owner for damages due to mineral entry.	Surface disturbance to federal lands would occur during exploration and development of private minerals.		
	Surface disturbances by Mr. A. K. McMillan could occur from mineral exploration and development on land next to the Rio Grande Wild and Scenic River.		Obtain from Mr. A. K. McMillan a scenic easement along the Rio Grande Wild and Scenic River.
Water Resources		Water Resources	
BLM could lose management of up to 1,500 acres of floodplains.			
Access to wells by USGS, Indian livestock operators, and Phillips Uranium could be lost.		If USGS and livestock operators apply for a right-of-way (ROW) permit to these wells prior to an exchange, place a clause in the patent to reserve access to these wells. Develop new water sources for livestock operators, i.e. Indian and Phillips Uranium, if land is selected with livestock wells located on it.	

TABLE 1-2 (continued)

Resource Impacts		Management Options	
Bisti Lands	Ute Mountain Lands	Bisti Lands	Ute Mountain Lands
Social and Economic Factors		Social and Economic Factors	
	Increase county revenue from $1,025.00 to approximately $10,794.00 with in lieu tax payments by the federal government.		
Public access and federal management of herbs and standstone located on lands selected in the exchange could be lost.			
Public access and federal management of burial and religious sites located on lands selected in the exchange could be lost.			
Livestock and Grazing		Livestock and Grazing	
The total known livestock grazing resource of a maximum of 9 Indian livestock operations could be eliminated. Up to 667 Animal Unit Months (AUMs) could be eliminated. Up to $1,504 could be lost to the government in annual revenue from grazing permits.	Approximately 982 AUMs (Soil Conservation Service) may be available for livestock grazing. Range condition may limit livestock grazing.	Select other Bisti Lands prior to selecting lands with Indian allotments.	
All of the public lands (264 AUMs) within the Phillips Uranium grazing lease could be eliminated. Up to $609 could be lost to the government in annual revenue from this grazing permit.			
A portion of 1,924 AUMs could be eliminated from federal management and go into private management by Paragon. A portion of $4,444 could be lost to the government in annual revenue for grazing permits.			

TABLE 1-2 (continued)

Resource Impacts		Management Options	
Bisti Lands	Ute Mountain Lands	Bisti Lands	Ute Mountain Lands
Cultural Resources		Cultural Resources	
Public access and federal management of between 8,00 to 9,600 acres acres of the Bisti Lands containing cultural resources could be lost.	Public access and federal management of 17,138 acres of the Ute Mountain Lands containing cultural resources could be acquired.		
Wilderness		Wilderness	
A loss of federal management could occur for any selected Bisti Lands that are adjacent to the WSAs.			
Recreation		Recreation	
A loss of federal management could occur for any selected lands that are adjacent to the Bisti/De-na-zin ACEC.			
Recreational opportunities occurring on the Bisti Lands would occur on other lands in the San Juan Basin.	Recreational opportunities such as sightseeing, ORV, hiking, backpacking, and cross country skiing could be available to the public.		
Wildlife		Wildlife	
Habitat for threatened or endangered species may occur.		May drop Bisti Land acreage having threatened or endangered species habitat from the exchange.	
A loss of federal management of land being utilized by a small herd of antelope.	Acquire federal management of land with less than 1% of each of 3 herd units.	Construction of water developments, fencing, and supply of adequate forage on those lands adjacent to the Bisti Lands selected in the exchange.	
The habitat on the exchange lands, for a maximum of 21 species of wildlife may not be managed by the BLM.	The habitat on the exchange lands for approximately 159 species of wildlife could be added to federal management.		

TABLE 1-2 (concluded)

Resource Impacts		Management Options	
Bisti Lands	Ute Mountain Lands	Bisti Lands	Ute Mountain Lands
Land Uses		Land Uses	
Future ROWs and expired permits would not be granted or extended by BLM.	Future ROWs may be granted by the BLM.		
Visual Resources		Visual Resources	
Public access and federal management to 2,193 acres of Class A scenic land could be lost.			

Note: a/ Federal Land Policy and Management Act.

TABLE 1-3

STANDARD OPERATING PROCEDURES

Paleontological Resources

Minerals

Place a clause in the patent to reserve the prior existing rights of Phillips Uranium to patent the surface estate of 140 mining claims and of lesses to develop 48 oil and gas leases.

Water Resources

Place a clause in the patent to restrict the uses that can occur on approximately 1,500 acres of floodplains (specifically construction).

Reimburse the BLM and Phillips Uranium for water developments that cannot be removed from land selected in an exchange.

Social and Economics Factors

Livestock Grazing

Reimburse the BLM or the livestock operator for developments that cannot be removed from land selected in an exchange.

Cultural Resources

1. Consult with the State Historic Preservation Officer (SHPO) on the level of cultural resources inventories necessary for the uninventoried areas of public land selected in the exchange.

2. Develop and implement mitigation plans in consultation with the SHPO and the Advisory Council on Historic Preservation for all National Register-eligible sites and Chacoan Road segments, if any are found.

Wilderness

Recreation

Wildlife

Section 7 consultation with the Fish and Wildlife Service (FWS) is required and will be conducted on the Bisti Lands selected in the proposed land exchange. The consultation would be conducted on specific lands selected for exchange. Consultation with the New Mexico Department of Game and Fish would be held concurrently with the FWS.

Land Uses

Place a clause in the patent to reserve the prior existing rights granted to the permittees for current permits issued under federal ownership. This reservation would not include the permits granted to PNM for meteorological sites and an electrical distribution line.

chapter 2

AFFECTED ENVIRONMENT

CHAPTER 2

AFFECTED ENVIRONMENT

This chapter describes the resource components of the environment that could be impacted by the proposed Ute Mountain Land Exchange. These resources include: paleontology, minerals, watershed, social and economic factors, livestock grazing, cultural resources, wilderness, recreation, wildlife, land uses, and visual resources. The descriptions reflect the expected magnitude and intensity of the impacts discussed in Chapter 3. Geology, soils, threatened or endangered plants, topography, and vegetation are not impacted and are, therefore, not discussed in the EA. Technical material supporting these descriptions and the analysis in Chapter 3 is located in the Appendix of this document or is on file and available for public inspection at the BLM Albuquerque District Office.

PALEONTOLOGY

Bisti Lands

Fossiliferous rocks within the area of the Bisti Lands include the Cretaceous Age Menefee, Cliff House, Lewis, Pictured Cliffs, Fruitland, and Kirtland Formations, and the early Tertiary Ojo Alamo and Nacimiento Formations. However, recent paleontologic surveys have revealed that the most important of these on the Bisti Lands are the Fruitland and Kirtland Formations (Kues, et al., 1977; USDI, BLM 1981). Past paleontologic studies have shown that these two formations contain valuable remains of dinosaurs and other reptiles, some of the earliest mammals, invertebrates, and plants (Kues, et al., 1977). A list of all presently known fossil taxa from the Fruitland and Kirtland Formations is presented in Appendix B of the Star Lake-Bisti Regional Coal Final Environmental Impact Statement (USDI, BLM 1979a).

Known fossil occurrences in Fruitland/Kirtland strata on the Bisti Lands are listed in Table 2-1. This table also shows the importance value for each occurrence. As used in this EA, importance values (ranging from Class I-Critical to Class IV-Not Important) are based on the definitions provided by Kues, et al. (1977). The definitions for the particular fossil classes are located in Appendix B. (Public land with Class I fossil occurences are shown on Map 2-1.)

Ute Mountain Lands

The exposed rocks on the Ute Mountain Lands are igneous and contain no paleontological resources.

MINERALS

Bisti Lands

Coal

Most of outstanding coal lease NM-0186613 and a limited amount of NM-0186612 are located in the Bisti Wilderness Study Area (WSA). Both leases

TABLE 2-1

NUMBER AND IMPORTANCE VALUES OF FOSSIL OCCURRENCES ON THE BISTI LANDS

Tract	Class I (Criticial)	Class II (Highly Important)	Class III (Important)	Class IV (Not Important)
T. 23 N., R. 12 W., NMPM				
Sec. 6 (Lots 8-23)			3	8
Sec. 13 (Lots 1-16)	1	4	19	40
Sec. 14 (Lots 1-8, $NW^{1/4}$)	1	4	30	55
Sec. 17 (Lots 1-13)			3	17
Sec. 22 (Lots 1-16)		2	5	9
Sec. 23 (Lots 1-8, $S^{1/2}$)	1	12	52	81
Sec. 24 (Lots 1-8, $S^{1/2}$)	1	6	20	46
Sec. 26 (All)		1	10	20
T. 23 N., R. 13 W., NMPM				
Sec. 1 (All)		6	5	11
Sec. 11 (Lots 1-4, $N^{1/2}$, $N^{1/2}S^{1/2}$)	1	8	6	7
Sec. 12 (Lots 1-4, $N^{1/2}$, $N^{1/2}S^{1/2}$)				1
Sec. 24 (All)		1	1	
Sec. 28 (All)			1	1
TOTALS (GRAND TOTAL = 500)	5	44	155	296

Sources: Kues, et al. 1977; USDI, BLM 1981.

R. 13 W. R. 12 W. R. 11 W. R. 10 W.

UNITED STATES DEPARTMENT OF THE INTERIOR
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ALBUQUERQUE DISTRICT OFFICE
ALBUQUERQUE, NEW MEXICO

UTE MOUNTAIN EXCHANGE
ENVIRONMENTAL ASSESSMENT

BISTI LANDS
MAP 2-1

T. 24 N.

T. 23 N.

T. 22 N.

RESERVATION

INDIAN

NAVAJO

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DE-NA-ZIN WSA

BISTI TRADING POST

BISTI WSA

AH-SHI-SLE-PAH WSA

Hunter Wash

Wash

Arroyo

De-Na-Zin Wash

Coal Creek

Chaco Wash

LEGEND

CLASS I & WILDERNESS STUDY AREAS

- SELECTED LAND
- WILDERNESS STUDY AREA
- PALEONTOLOGICAL CLASS I AREA

CONTOUR INTERVAL - 20 METERS

NORTH

1 0 1 2 3 MILES

SCALE: 1:126,720

SEPTEMBER 1981

were issued to Western Coal Company, now Sunbelt Mining Company (Sunbelt), a subsidiary of PNM. Under Public Law 96-475 (94 Stat. 2269), signed October 1980, Sunbelt can obtain other coal-bearing federal lands in New Mexico in exchange for those leases. The public lands from which selection would occur for this coal lease exchange are listed in Table 2-2. Approximately 2,640 acres of the lands provided for the coal lease exchange overlap with land being considered for the Ute Mountain Land Exchange. Of the amount of land identified in P.L. 96-475, coal lands not selected in the coal lease exchange could be competitively leased. (See Map 2-2).

There are approximately 4,800 acres of potential underground coal areas, and 2,560 acres of potential surface mining areas (which could be considered for competitive coal leasing) overlapping the proposed exchange lands (see Map 2-2).

Oil and Gas

In a letter dated February 11, 1980, the U.S. Geological Survey (USGS) indicated that all of the Bisti Lands are valuable for oil and gas; however, according to the BLM's Chaco Planning Unit Resource Analysis (USDI, BLM. 1980d), there were no producing oil or gas wells on the Bisti Lands as of January 1, 1980. There are approximately 48 oil and gas leases on the Bisti Lands. The serial numbers and legal descriptions of these leases, to the nearest section, are listed in Appendix C.

Locatable Minerals

Phillips Uranium has 140 claims staked on the Bisti South Lands. Paragon has a total of 879 claims, all of which are on the Bisti North Lands. All of the claims on the Bisti Lands are lode claims (refer to Glossary). This type of claim allows the claimant to use the surface and any of the surface resources on the claim.

Saleable Minerals

There are large deposits of sand, gravel, and humates (refer to Glossary) on the Bisti Lands, but there has not been enough study on these deposits for exact reserves to be estimated. The sand and gravel is found along most washes, and the humates are generally associated with coal deposits.

Saleable minerals are sold by the BLM in one of two ways. Sales for less than $5,000 can be made noncompetitively upon request if no competitive interest exists. The limit is $10,000 if the material is used in connection with a federal lease and it is not practical to obtain competition. Sales over $5,000 (where material is not used in connection with a federal lease) must be competitive, and the BLM must guarantee access.

Ute Mountain Lands

Mineral rights on the Ute Mountain Lands are owned by two different parties. Paragon and Mr. A. K. McMillan each own three-eights of the mineral interest. The Rio Costilla Cooperative Livestock Association owns one-fourth non-participating interest.

TABLE 2-2

PUBLIC LANDS AVAILABLE FOR COAL LEASE EXCHANGE

Legal Description		Acreage Overlap with Bisti Lands
T. 23 N., R. 12 W., Sec. 5,	$S^{1}/2$	0
6,	$S^{1}/2$	320
7,	All	600
8,	All	480
9,	$W^{1}/2$	160
17,	$E^{1}/2$, $E^{1}/2W^{1}/2$, $NW^{1}/4W^{1}/4$	480
18,	$N^{1}/2N^{1}/2$	40
20,	$NE^{1}/4$, $NE^{1}/4NW^{1}/4$	200
21,	$W^{1}/2NW^{1}/4$	80
T. 23 N., R. 13 W., Sec. 1,	$NW^{1}/4$, $NW^{1}/4SW^{1}/4$, $N^{1}/2NE^{1}/4$, $SE^{1}/4NE^{1}/4$, $NE^{1}/4SE^{1}/4$	280
	TOTAL	2,640

R. 13 W. R. 12 W. R. 11 W. R. 10 W.

T. 24 N.

T. 23 N.

T. 22 N.

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

ALBUQUERQUE DISTRICT OFFICE
ALBUQUERQUE, NEW MEXICO

UTE MOUNTAIN EXCHANGE
ENVIRONMENTAL ASSESSMENT

BISTI LANDS
MAP 2-2

RESERVATION

INDIAN

NAVAJO

BISTI TRADING POST

Hunter Wash

Clark Wash

De-Na-Zin Wash

Coal Creek

Chaco Wash

371

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LEGEND

COAL

- LIKELY UNDERGROUND MINING AREAS
- LIKELY SURFACE MINING AREAS - NO SPECIAL MULTIPLE USE CONSIDERATIONS
- LIKELY SURFACE MINING AREAS - SPECIAL INVENTORY AND MITIGATION STIPULATIONS FOR PALEONTOLOGY, ARCHEOLOGY, WILDLIFE, AND RECREATION (SCENIC)
- NOT CARRIED FORWARD FOR FURTHER LEASING CONSIDERATION
- SELECTED LAND
- COAL LEASE EXCHANGE

NORTH

1 0 1 2 3 MILES

SCALE: 1:126,720

SEPTEMBER 1981

Paragon and Mr. A. K. McMillan can explore and develop minerals on these lands. The Livestock Association cannot initiate mineral exploration or development action, but is guaranteed profits from any mineral discovery and development by Paragon or Mr. A. K. McMillan. Both parties are guaranteed the right of ingress and egress for the purpose of exploring for and removing oil, gas, and other minerals. They also can obtain rights-of-way for roads, ditches, and utilities (PNM, 1979).

Paragon conveyed a scenic easement to the BLM in March 1980, which gives the BLM control over Paragon's activities on a quarter-mile wide stretch of land along the river. Paragon cannot undertake any surface-disturbing activities within this scenic easement; however, Paragon can conduct mining activities on the rest of the Ute Mountain Lands. Mr. A. K. McMillan has access to land along the river for mining activities.

In a letter to the BLM dated February 11, 1980, the USGS indicated that the Ute Mountain Lands are without value for locatable or leasable minerals. Saleable minerals of sand, gravel, and volcanic cinder are present on the Ute Mountain Lands. There is a small cinder quarry on the lower southeast flank of Ute Mountain, apparently inactive at this time.

WATER RESOURCES

Bisti Lands

Flood Hazard Boundary Maps prepared by the Federal Insurance Administration indicate that numerous floodplains occur on the Bisti Lands. (Copies of these maps are available in the BLM Albuquerque District Office.) Table 2-3 lists the floodplain acreage in each section being considered for exchange. Total floodplain acreage on the Bisti Lands is estimated at 1,491 acres. Map 2-3 shows the major floodplains in the area.

The quality of surface waters is poor because of high concentrations of suspended and dissolved solids. (Data on the chemical quality of runoff from five different locations throughout the Bisti Lands is on file at the BLM Albuquerque District Office). Suspended sediment concentrations are high in all surface runoff from the Bisti Lands, being highest in rainfall runoff. De-na-zin Wash averages 369,000 tons per year, a yield of 0.92 acre-feet per square mile per year. In general, surface water quality appears to be a function of the percentage of badlands in the drainage.

Nineteen wells are known to exist on the Bisti Lands, and all draw water from poor, shallow aquifers (Table 2-4 and Map 2-4). Nine are observation wells for PNM, and six are observation wells for the U.S. Geological Survey. Of the two BLM stockwater wells, the Bisti No. 3 well was drilled in 1964 at an expense to the BLM of $7,753. The other well, Jacob's well, was drilled in 1965 under a cooperative agreement at a cost to the permittee of $23,400. The Ashcroft Northeast well was drilled in 1966 at a cost to the permittee of $1,000. Paragon acquired title to this well when they bought the Tsaya base property. The well at the Tsaya Spring site is abandoned.

TABLE 2-3

FLOODPLAIN ACREAGES ON BISTI LANDS

Location	Channel Designation	Acres	
T. 24 N., R. 13 W., Sec. 31	Hunter Wash	86	
T. 24 N., R. 13 W., Sec. 36	Alamo & Willow Washes	46	
T. 24 N., R. 11 W., Secs. 22, 27, and 28	De-na-zin Tributary	71	
T. 23 N., R. 13 W., Sec. 1	Alamo Wash	88	
T. 23 N., R. 13 W., Sec. 6	Hunter Wash Tributary	28	
T. 23 N., R. 13 W., Sec. 12	Alamo Wash De-na-zin Tributary	91 11	] 102
T. 23 N., R. 13 W., Sec. 13	Alamo Wash De-na-zin Wash	11 72	] 83
T. 23 N., R. 13 W., Sec. 14	De-na-zin Wash	155	
T. 23 N., R. 12 W., Sec. 6	De-na-zin Tributary	20	
T. 23 N., R. 12 W., Sec. 7	De-na-zin Tributary De-na-zin Wash	27 44	] 71
T. 23 N., R. 12 W., Sec. 8	De-na-zin Wash & Coal Creek	129	
T. 23 N., R. 12 W., Sec. 9	De-na-zin Wash	28	
T. 23 N., R. 12 W., Secs. 12, and 13	Coal Creek	36	
T. 23 N., R. 12 W., Sec. 13	Coal Creek	17	
T. 23 N., R. 12 W., Sec. 14	Coal Creek	26	
T. 23 N., R. 12 W., Sec. 17	Coal Creek Tanner Lake	2.5 8.3	] 10.8
T. 23 N., R. 12 W., Sec. 18	De-na-zin Wash	19	
T. 23 N., R. 12 W., Sec. 19	De-na-zin Tributary	8.0	
T. 23 N., R. 12 W., Sec. 20	De-na-zin Tributary	75	
T. 23 N., R. 12 W., Sec. 21	De-na-zin Tributary	5.3	
T. 23 N., R. 12 W., Sec. 22	Coal Creek Tributary	33	
T. 22 N., R. 13 W., Sec. 24	Tsaya & Chaco Canyon	38	
T. 22 N., R. 12 W., Sec. 10	Tsaya Canyon	99	
T. 22 N., R. 12 W., Sec. 18	Tsaya Canyon	77	
T. 18 N., R. 12 W., Sec. 2	Kim-me-ni-oli Tributary	41	
T. 18 N., R. 12 W., Sec. 11	Kim-me-ni-oli Tributary	38	
T. 18 N., R. 12 W., Sec. 14	Kim-me-ni-oli Tributary	2.8	
T. 18 N., R. 12 W., Sec. 23	Kim-me-ni-oli Tributary	58	
TOTAL		1,491.0	

Source: U.S. Dept. of Housing and Urban Development, Federal Insurance Administration 1977 and 1978.

R. 13 W. R. 12 W. R. 11 W. R. 10 W.

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ENVIRONMENTAL ASSESSMENT

BISTI LANDS
MAP 2-3

T. 24 N.

T. 23 N.

T. 22 N.

T. 18 N.

RESERVATION

INDIAN

NAVAJO

BISTI TRADING POST

Hunter Wash

Bisti Wash

De-Na-Zin Wash

Coal Creek

Chaco Wash

371

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LEGEND

FLOODPLAIN AREAS

SELECTED LAND

FLOODPLAIN

Contour Interval - 20 Meters

NORTH

1 0 1 2 3 MILES

SCALE: 1:126,720

R.12W.

R. 13 W. R. 12 W. R. 11 W. R. 10 W.

SEPTEMBER 1981

TABLE 2-4

EXISTING WELLS ON THE BISTI LANDS

Location	Name	Type of Well
T. 23 N., R. 13 W., Sec. 10	Bisti No. 3	BLM Stockwater Well
T. 18 N., R. 12 W., Sec. 11	Jacob's Well	BLM Stockwater Well
T. 23 N., R. 12 W., Sec. 23	Ashcroft Northeast	Stockwater Well
T. 22 N., R. 13 W., Sec. 24	Tsaya Spring Site	Abandoned
T. 23 N., R. 12 W., Sec. 6	AMW 6-1 Coal Well	USGS Observation Well
T. 23 N., R. 12 W., Sec. 7	TL-7-2 Coal Well	USGS Observation Well
T. 23 N., R. 12 W., Sec. 7	Bisti DH 3 Well	USGS Observation Well
T. 23 N., R. 12 W., Sec. 8	TL-8-1	USGS Observation Well
T. 23 N., R. 12 W., Sec. 8	Bisti DH-7	USGS Observation Well
T. 23 N., R. 12 W., Sec. 17	Bisti DH-5	USGS Observation Well
T. 23 N., R. 13 W., Sec. 1	A-1	PNM Observation Well
T. 23 N., R. 13 W., Sec. 12	A-2	PNM Observation Well
T. 23 N., R. 13 W., Sec. 12	A-3	PNM Observation Well
T. 23 N., R. 13 W., Sec. 14	A-4	PNM Observation Well
T. 23 N., R. 13 W., Sec. 14	A-5	PNM Observation Well
T. 23 N., R. 13 W., Sec. 14	A-6	PNM Observation Well
T. 23 N., R. 13 W., Sec. 12	A-7	PNM Observation Well
T. 23 N., R. 13 W., Sec. 1	PC-1	PNM Observation Well
T. 23 N., R. 13 W., Sec. 10	PC-2	PNM Observation Well

Source: Geohydrology Associates, Inc. 1980.

The quality of ground water in the area ranges from fair to poor; however, as it is the only water available, it is widely used for stock and domestic purposes. (Data on ground water quality of the Bisti Lands is on file at the BLM Albuquerque District Office.)

SOCIAL AND ECONOMIC FACTORS

Bisti Lands

The Bisti Lands considered in this exchange are located in south-central San Juan County and north-central McKinley County. These areas are sparsely inhabited by Navajo Indian people who have lived in the area for many years. They have lived a pastoral life style and informal discussions with some of them indicate their feelings that their livestock provide their primary livelihood. They also express concern for sacred and religious activities significant to Navajo culture and lifestyle. Figures were not available to indicate the amount and source of their money income.

There are nine Navajo operators grazing livestock on four allotments and using 667 Animal Unit Months (AUMs) of forage. (Other details of livestock use on the Bisti Lands are discussed in the Livestock Grazing Section of this chapter.)

The Navajo people who live in the area believe in and live by the following philosophy: "Our God is all over - just as we point to our Mother Earth. It starts from the east to the west, and from the south to the north - just as our prayers and chants." These people gather herbs and sandstone for different ceremonies. It is important how herbs are gathered and where sandstone is obtained. The Navajos also have sacred sites and points for making religious offerings. There are gravesites scattered over some of the surrounding area that have meaning to the Navajo because of their burial customs. Ten apparent gravesites were recorded during archeological inventories.

Ute Mountain Lands

Taos County received tax revenues of $1,025 in 1980 from the owners of the Ute Mountain Lands.

LIVESTOCK GRAZING

Bisti Lands

As shown on Map 2-4, portions of seven allotments in the Chaco Planning Unit are involved in the proposed Ute Mountain Exchange (refer also to Table 2-5). The blocked areas of public lands, mixed with little or no Indian allotted lands, are currently managed by the BLM (Section 3 administration--refer to the Glossary). Two allotments in the area (Allotment Nos. 6010 and 6012), are held by Paragon Resources (Section 4 administration--refer to the Glossary). A third allotment (6036) is located on the Bisti South Lands and is leased by Phillips Uranium Co. (Section 15 administration--refer to the Glossary).

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ENVIRONMENTAL ASSESSMENT

BISTI LANDS
MAP 2-4

T. 24 N.

T. 23 N.

T. 22 N.

T. 18 N.

RESERVATION

INDIAN

NAVAJO

BISTI TRADING POST

Bisti Community

Black Lake

Otis Community

Smith

Tsaya

Lake Valley Community

Jacob's Unit

R.12W.

Wash

Hunter

De-Na-Zin

Coal

Creek

Chaco

371

57

LEGEND

RANGE ALLOTMENTS, DEVELOPMENTS, & WELLS

- ALLOTMENT BOUNDARY
- SELECTED LAND
- RETENTION DAM
- BLM WELL
- USGS WELL
- FENCE
- PNM WELL
- CORRAL
- CATTLEGUARD
- WINDMILL

CONTOUR INTERVAL - 20 METERS

1 0 1 2 3 MILES

NORTH

SCALE: 1:126,720

SEPTEMBER 1981

TABLE 2-5

BISTI LANDS ALLOTMENT INFORMATION

Allot. No.	Allot. Name	Allotment Acreage						AUM Qualifications		Admin. Status	No. of Operators[b]	Class of Livestock[c]	Season of Use	Acres Involved in Exchange	AUMs Involved (est.)[d]
		Public	Private	State	Indian Allot.	Other[a]	Total	Federal	Total						
6008	Bisti Community	9,507	40	2,155	13,598		25,300	764	Adobe Lease	Sec. 15 (BIA)[e]	24(4)	S,C, H,G	Yearlong	4,029	219
6009	Eli Smith	2,107			619		2,726	237	PLO 3662	Sec. 15 (NT-BIA)[f]	(1)	S,C, H,G	Yearlong	2,107	237
6010	Black Lake (Paragon Resources)	40,093	160	15,760	9,838		65,851	4,560	6,780	Sec. 3 (BLM)	1	C	Yearlong	4,427	391
6011	Otis Community	30,871		240	5,716		36,827	3,260	Adobe Lease	Sec. 15 (BIA)	19(2)	S,C, H,G	Yearlong	960	101
6012	Tsaya[g] (Paragon Resources)	13,208	680	2,080	5,680		21,648	1,533	1,980	Sec. 3 (BLM)	1	C	Yearlong	13,208	1,533
6016	Lake Valley Community	974		3,320	85,649	200	90,143	110	PLO 3662	Sec. 15 (BIA)	49(2)	S,C, H,G	Yearlong	974	110
6036	Jacob's Unit (Phillips Uranium Company)	2,010	1,440	4,087	480		8,017	264	264	Sec. 15 (BLM)	1	C	Yearlong	2,010	264
TOTALS		98,770	2,320	27,642	121,580	200	250,512							27,715	2,885

Source: USDI, BLM 1980.

Notes:
[a] National Park Service Lands
[b] Numbers taken from BIA records. Those in parentheses reflect operators actually affected by the exchange; others reflect total number of operators on the allotment.
[c] Class of Livestock: S = sheep, C = cattle, H = horses, G = goats.
[d] AUMs for allotment 6008, 6010, and 6011 were determined by compiling one year's dipping data by vegetative type. These are estimates. AUM figures for allotments 6009, 6012, 6016, and 6036 reflect total public land grazing preferences.
[e] Bureau of Indian Affairs.
[f] NT - Navajo Tribe
[g] AMP Allotment

Four other allotments (Allotment Nos. 6008, 6009, 6011 and 6016) are held by the Navajo Tribe and contain scattered tracts of public lands. They are administered by the Bureau of Indian Affairs (BIA) through a cooperative agreement dated September 15, 1978. The BLM has set carrying capacities for public lands within these four allotments. The BLM leases these allotments (Section 15 administration) to the Navajo Tribe. Because of the complex land patterns and special rules under which the BIA allotments are administered, the BLM has little knowledge of actual livestock operators, permitted numbers, class of livestock, or range developments on these allotments.

Livestock grazing historically has been and is presently, the primary land use in the area. All allotments on the Bisti Lands are grazed yearlong, with the four BIA and/or Navajo Tribe administered allotments authorized for grazing by all classes of livestock (cattle, sheep, horses and goats). The remaining three allotments are authorized for cattle only.

Allotment number 6012 (Tsaya) is under an Allotment Management Plan (AMP) initiated in 1970. A 1975 allotment evaluation indicated a definite improvement in range condition on the allotment, primarily as a result of good plant vigor and proper utilization. Range condition continues to improve on the allotment. Valid range condition and trend data on the remainder of the non-AMP allotments does not exist.

On the three community allotments (6008, 6011, 6016) within the area, the operators are individual Navajo families who run small bands of sheep and goats. Range condition on many of these allotments is considered poor and in a downward trend as a result of heavy stocking rates, poor distribution, and yearlong use.

Poisonous Plants

Poisonous plants are a constant but not a serious problem. Noxious plants (e.g., tansy mustard, black greasewood) are distributed throughout the area with few areas of concentration.

Existing Developments

Known existing developments are shown on Map 2-4 and Table 2-6. They include 3 wells, 10 reservoirs, 1 corral, 9.8 miles of fence, and 2 cattleguards. This list of developments is probably not complete, particularly on the four allotments not administered by the BLM. More detailed information for these four allotments is not available.

Ute Mountain Lands

Presently, there is very limited livestock use in the area. An unknown, limited number of cattle drift into the northwestern corner of the Ute Mountain Lands from Colorado. Also, some seasonal (winter) sheep use occurs along the western edge of the area at the state line. Past livestock use has been heavy on the more level areas, but specific information on season of use or class and number of livestock is not available. Grazing has been light to non-existent in the pinyon-juniper type of vegetation. The Soil Conservation Service (SCS) inventory of November, 1980 indicates that a total of 982 AUMs are

TABLE 2-6

EXISTING DEVELOPMENTS ON BISTI LANDS [a/]

Allot. Numbers	Job Numbers	Job Name	Units of Measurement	Funding		Maintenance Responsibility	Year Completed	Remarks
				BLM	Range User			
6008	1685	Bisti Well No. 3	1	7,791	——	Range User	1964	
6009	4129	Eli Smith Reservoir	3,880 cu. yd.	——	1,010	Range User	1970	
6010	2972	Willcoxson Corral	1	——	10,000	Range User	1966	
6012	4121	Ashcroft Reservoir	3,600 cu. yd.	——	525	Range User	1969	
6012	4016	Ashcroft Pit	5,310 cu. yd.	1,977	——	BLM	1969	
6012	4017	Ashcroft Pit	5,740 cu. yd.	1,977	——	BLM	1969	
6012	4019	Ashcroft Pit	5,740 cu. yd.	1,977	——	BLM	1969	
6012	4020	Ashcroft Pit	5,740 cu. yd.	1,977	——	BLM	1969	
6012	4021	Ashcroft Pit	5,740 cu. yd.	1,977	——	BLM	1969	
6012	4022	Ashcroft Pit	3,665 cu. yd.	1,466	——	BLM	1969	
6012	2948	Ashcroft Well	1	——	1,000	Range User	1966	
6012	None	Ashcroft Reservoir	[b/]	[b/]	[b/]	Range User	1933	Base Water
6012	None	Ashcroft Reservoir	[b/]	[b/]	[b/]	Range User	1932	Base Water
6012	3559	Ashcroft Fence and cattleguards	5.3 miles 2	6,885	——	Range User	1970	
6036	1053	Jacobs Boundary Fence	3.5 miles	——	1,750	Range User	1949	
6036	1741	Willcoxson Fence	1.0 mile	——	800	Range User	1940	
6036	1747	Jacobs Well	1	——	23,400	Range User	1965	
		TOTALS		26,027	69,346			

Notes: [a/] These developments are shown on Map 2-4. Developments not included in this table are known to exist but more detailed information is not available.

[b/] Data not available.

currently available for livestock grazing. There are no known existing range developments on the area, except that a portion of the boundary is fenced.

Poisonous plants are not frequent. Known species that occur are pinque and milkvetch.

CULTURAL RESOURCES

Bisti Lands

Archeological Sites

Cultural resources inventories have been completed on 11,352 acres of the total 27,715 acres of the Bisti Lands (refer to Appendix D.) Since publication of the Draft EA, 1,280 acres of the 11,352 acres were intensively inventoried by ESCA-TECH Corporation.

The BLM has now identified 304 sites on the Bisti Lands. Twenty-one sites have two components. Because these components represent separate occupations by different cultural groups, the cultural/temporal affiliation of each component has been tabulated separately on Table 2-7.

Based on a recommendation of the State Historic Presevation Officer (SHPO), 163 or 50 percent of the components are classified as lithic, which means they are of essentially unknown cultural derivation. Many of these components may be Archaic, but only 37 or 11 percent of the evaluated components were judged to contain sufficient data for a reliable determination of Archaic affiliation.

The 22 Anasazi components represent 7 percent of the components on the Bisti Lands. The most widely known Anasazi sites are the multistory pueblos within Chaco Culture National Historical Park. Two Chacoan outliers, Pierre's Ruin and Lake Valley, are in the vicinity of the Bisti Lands. Both of these outliers are on the State Register of Historic Places and have been nominated to the National Register.

The Chacoan outliers are thought to have been connected with the communities in Chaco Canyon by a prehistoric road system. Much of the area to the north of Chaco Canyon has not been examined for evidence of this prehistoric road system. Obenauf (1980) has transferred segments of Chacoan roads from aerial photos to 7.5 minute USGS topographic quads. If the imaged segments on the quads are projected along their apparent trajectories, some segments could extend across the Bisti Lands, a possibility being investigated by the BLM Chaco Roads Project.

In addition to the Anasazi and Archaic archeological resources already discussed, there is evidence of historic Navajo occupation on the Bisti Lands. The 78 Navajo components constitute 24 percent of the components. Most of the 25 historic undifferentiated components may also be Navajo. If this assumption is valid, Navajo components would total 32 percent of the components.

TABLE 2-7

ARCHEOLOGICAL RESOURCES ON THE BISTI LANDS

Cultural/Temporal Affiliation	Known Sites Components	Isolated Artifacts
Lithic Undifferentiated	45	77
Archaic Undifferentiated	102	29
Jay (5500-4800 B.C.)	0	0
Bajada (4800-3200 B.C.)	3	0
San Jose (3200-1800 B.C.)	1	0
Armijo (1800-800 B.C.)	1	2
En Medio (800 B.C.-A.D. 400)	6	0
Anasazi Undifferentiated	5	4
Basketmaker III (A.D. 450-750)	1	0
Basketmaker III-Pueblo I (A.D. 450-850)	1	0
Pueblo I (A.D. 750-850)	0	0
Pueblo I-Pueblo II (A.D. 750-1000)	0	1
Pueblo II (A.D. 850-1000)	9	0
Pueblo II-Pueblo III (A.D. 850-1350)	3	1
Pueblo III (A.D. 1000-1350)	0	0
Navajo Undifferentiated	21	22
Early Agricultural/Post Bosque Redondo (A.D. 1500-1881)	0	0
Trading Post (A.D. 1881-1933)	22	0
Trading Post-Modern Transitional (A.D. 1881-1950)	2	0
Trading Post-Modern Navajo (A.D. 1881-Present)	2	0
Modern Transitional (A.D. 1933-1950)	11	0
Modern Transitional-Modern Navajo (A.D. 1933-Present)	1	0
Modern Navajo (A.D. 1950-Present)	15	0
Anglo Undifferentiated	1	0
Historic Undifferentiated	21	61
TOTALS	273	197

Source: BLM Albuquerque District Archeological Site Files

ESCA-TECH Corporation has developed a computer model to project site density. A discussion of this project and a map of the study area are contained in the cultural resources section of the PRLA Final Environmental Assessment (FEA). Computer data from this project has been used to predict the site density on that portion of the Bisti Lands that fall within the study area. Map 2-5 is a graphic display of site density as predicted by the computer model.

National Register Eligibility

Consultation with the SHPO on July 21, 1981 was made for the purpose of applying criteria of eligibility for the National Register of Historical Places to known sites on the Bisti Lands. A record of this consultation is on file with the BLM Albuquerque District Office. The SHPO has recommended that 97 of the known sites, including the Crane Petroglyphs, are eligible for the register, 143 sites are not eligible, and insufficient information is available on 64 sites for the criteria to be applied.

All sites recommended as eligible were judged to meet register criterion (d): "[Sites] That have yielded, or may be likely to yield, information important in prehistory or history."

In addition, three sites were also judged to meet register criterion (c): "[Sites] That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction."

The BLM will submit additional information to the SHPO on sites for which recommendations of eligibility have not yet been made. All recommendations will be forwarded by the BLM to the Secretary of the Interior in accordance with 36 CFR 800.4.

Gravesites

No systematic search for gravesites has been made on the Bisti Lands. Ten apparent gravesites were recorded during archeological inventories. These sites were tentatively identified as historic Navajo. The Bisti Lands probably also contain prehistoric Anasazi and Archaic burials.

Sacred Sites

One Navajo sacred site and a gathering site at the Crane Petroglyphs have been identified on the Bisti Lands. The area could contain other offering points and gathering areas having sacred qualities for one or more traditional religious specialists.

Ute Mountain Lands

Very little is known about the cultural resources of this area. No systematic cultural survey has ever been conducted on or close to the Ute Mountain Lands. A two-day limited field reconnaissance was conducted by PNM in

R. 13 W. R. 12 W. R. 11 W. R. 10 W.

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BISTI LANDS
MAP 2-5

T. 24 N.

T. 23 N.

T. 22 N.

RESERVATION

INDIAN

NAVAJO

BISTI TRADING POST

371

57

Hunter Wash

Wash

Coal Wash

Chaco Wash

LEGEND

PREDICTED ARCHEOLOGICAL SITE DENSITY

0 - 5	16 - 20
6 - 10	21 - 30
11 - 15	41 - 50
SELECTED LAND	

Source: ESCA-TECH Corp Computer Model Project, 1981.

1 0 1 2 3 MILES

NORTH

SCALE: 1:126,720

SEPTEMBER 1981

October of 1979 to provide a preliminary assessment of the types of cultural resources that are present in the area. No systematic sampling was attempted during this reconnaissance. The following information on this reconnaissance comes from the report prepared by PNM on the proposed Top O' the World Exchange Lands (PNM, 1979).

Seven sites were identified during this reconnaissance. Two of these are undiagnostic lithic scatters, and a third appears to be a late prehistoric or early historic habitation site. Certain features of this site are similar to Navajo hogan bases, but the site may reflect Apachean, Ute, plains or northern tribes origin. It may be eligible for nomination to the National Register of Historic Places on the basis of its potential for scientific data.

The four remaining identified sites are historic. One of these is a site dating between 1900 and 1925 that is probably associated with the heavy logging believed to have occurred on Ute Mountain during this period. The other three historic sites are sheep herding facilities dating between 1900 and 1930.

The cultural resources identified during the reconnaissance represent a variety of cultural adaptations that are poorly understood at present. The area has the potential for evidence of a 10,000-year range of human activity. The probable predominant site type is isolated artifacts and light scatters associated with hunting and butchering from the Paleoindian period through the late 19th century. Archaic activity in the area seems certain. No extensive lithic sites have been found, but definable evidence of Archaic activity might be revealed in a systematic survey. No evidence of Puebloan occupation has been found, and any activity in the area may have been transient. Historic period sites appear to be well-represented. There are no properties on or near the Ute Mountain Lands currently listed on the National or State Registers of Historic Places.

WILDERNESS

Inventory Units NM-010-57, Bisti; NM-010-09, Ah-shi-sle-pah; and NM-010-04, De-na-zin, meet all the requirements necessary for Wilderness Study Areas (WSAs). They exhibit the fundamental wilderness characteristics of size, naturalness, and the opportunity for solitude and for primitive and unconfined recreation. In addition, supplemental values (scenic, scientific, and educational) enhance the basic WSA characteristics. Map 2-1 shows the location of the three WSAs and the exchange lands. (Detailed descriptions of the WSAs' wilderness characteristics, inventory reports and maps, and legal descriptions are available upon request from the BLM Albuquerque District Office. Large-scale overlays and topographic maps for each area are in the permanent file for each WSA.)

The southern portion of the Bisti WSA is contiguous with the northern portion of the Bisti Exchange Lands in T. 23 N., R. 13 W. The De-na-zin WSA is located approximately one mile northeast of the Bisti Exchange Lands, and the Ah-shi-sle-pah WSA is located approximately six miles southeast of the Bisti Exchange Lands.

RECREATION

Bisti Lands

The primary recreational opportunities on the Bisti Lands are categorized as dispersed recreation (non-consumptive--refer to the Glossary). Examples of activities falling into this category and provided by the Bisti Lands include: sightseeing (geological, zoological, and paleontological), off-road vehicle use (ORV), hiking, and rock collecting. Other forms of dispersed recreation such as hunting, camping, and picnicking were not identified in the BLM's land use planning documents as occurring on the Bisti Lands.

The estimated 1980 demand for selected recreation activities in the Chaco Planning Unit is listed in Table 2-8. The exact use and potential demand statistics for the Bisti Lands are not available.

Ute Mountain Lands

Access to the Ute Mountain Lands is presently controlled by Paragon, limiting recreational opportunities for the public. Therefore, a true representation of potential or actual recreation demand has not yet been measured. Observations by BLM personnel during the 1979-80 field season indicate that the area does possess recreational opportunities as discussed below. These would be available to the recreationist should the land come under public ownership.

Visitor use of the Rio Grande has steadily grown since the first records were kept in April 1975 (refer to Table 2-9). Actual user day figures for that portion of the river bordering the exchange lands are found in Table 2-10.

Backpacking, the scenic values of the Rio Grande Gorge and River, and scattered, unstabilized archaeological ruins are present. A primitive hiking trail has been developed by river runners to exit the gorge. Because of the remoteness of the area and the quantity of snow that accumulates during the winter months, this area could be used by cross-country skiers.

The only developed and intensively managed facility in the immediate area is a 1,200-acre BLM recreation site located approximately 14 miles due south of the Ute Mountain Lands. This facility provides 47 camping and day use sites, 28 trailer camp spaces, and a visitor center. While this site may be considered to be some distance from the exchange lands, topographic characteristics and the prominence of Ute Mountain itself contribute to visitor experience at the Rio Grande Gorge recreation site.

WILDLIFE

Bisti Lands

Listed Wildlife Species

There are three federal and state listed species whose presence is likely but as yet unverified on the Bisti Lands; the bald eagle (endangered/State Group II), the peregrine falcon (endangered/State Group I),

TABLE 2-8

ESTIMATED DEMAND FOR SELECTED RECREATION ACTIVITIES
IN THE CHACO PLANNING UNIT - 1980

Activity	Activity Occasions[a/]	
	Total in Planning Unit	Total on Public Lands
Visiting cultural sites	34,537	9,923
Sightseeing	89,299	23,763
Backpacking/Hiking	6,454	2,218
Recreational vehicle use	30,837	6,568
Horseback riding	285,929	56,733
Photography/Painting	98,313	26,529
Rock collecting	32,001	9,569

Source: New Mexico State Planning Office 1976 (figures prorated for Planning Unit).

Note: [a/] Activity Occasions - this unit is defined as one person participating in one recreation activity during 12 or more hours of one day.

TABLE 2-9

VISITOR USE AT THE RIO GRANDE WILD AND SCENIC RIVER
RECREATION VISITORS CENTER (Visitor Days)

Year	April	May	June	July	August	Sept	Total
1975	214	325	501	928	864	319	3,151
1976	488	740	1,216	2,680	2,132	712	7,968
1977	632	1,092	2,684	4,740	3,520	1,064	13,732
1978	825	1,106	2,945	5,214	4,162	1,291	15,543
1979	689	945	2,807	4,912	4,068	1,555	14,976
1980	521	1,467	3,115	4,890	4,230	1,816	16,039

Source: BLM calculations 1981.

TABLE 2-10

PERMITTED USE ON THE RIO GRANDE WILD AND SCENIC RIVER
FOR THE 1979 SEASON

	Private User Days	%	Commercial User Days	%	Section Total User Days
Upper Box	219	38	357	62	576
Lower Box	1,465	41	2,092	59	3,557
TOTALS	1,684	41	2,449	59	4,133

Source: USDI, BLM 1980c.

and the black-footed ferret (endangered/State Group I). (Refer to the Glossary for a discussion of the state listing for Group I and II.)

Wetland-Riparian Habitat

Available information on the wetland-riparian habitat of the Bisti lands is inadequate. It is assumed that there are few, if any, wetland-riparian areas on the Bisti Lands.

Comprehensive Resource Management

The Bisti Lands are south of the boundary of the Farmington Antelope Herd Unit designated by the New Mexico Department of Game and Fish (NMDGF). None of the Bisti Lands occur within what the NMDGF officially calls occupied antelope range (NMDGF 1978), but BLM Farmington Resource Area personnel have seen antelope in the general area. No other big game animals covered by the NMDGF Operational Plan are known to occur on the Bisti Lands.

Habitat Diversity

The Bisti Lands are within the plains grasslands biome (Run Wild Identification No. 422.000 USFS 1980). (Refer to the Glossary for a discussion on selecting the biome as the level of analysis in this section.) According to the map used for this assessment, the plains grasslands biome is abundant in northwest New Mexico (USFS 1980). Information from the Chaco Planning Unit URA (USDI, BLM 1980d) shows that sagebrush, pinyon-juniper, grasslands and badlands make up the major vegetative habitat types on the Bisti Lands. The topographic diversity for habitat on the Bisti Lands is limited to open, flat to rolling plains.

Species Diversity

The Bisti Lands include habitat for approximately 21 species of wildlife not found on the Ute Mountain Lands. These species include 2 amphibian species, 6 bird species, 10 mammal species, and 3 reptile species. The two amphibians are not listed (recovery--refer to the Glossary), game, or harvest species. Two of the 10 mammal species (the kit fox and the eastern spotted skunk) are sometimes harvested for their fur. The 3 reptile species are not listed or harvest species. (File material at the BLM Albuquerque District Office contains a complete listing of species and further information on species diversity.)

Ute Mountain Lands

Listed Wildlife Species

The three federal and state listed species on the Bisti lands are also listed for Ute Mountain Lands. Three additional state-listed species also probably occur: the western toad (Group II), the marten (Group II), and mink (Group II).

Wetland-Riparian Habitat

The Rio Grande (adjacent to the Ute Mountain Lands) is the only known wetland-riparian area. No perennial streams or springs are known on the Ute Mountain Lands, but there may be seepages in the Rio Grande. Because of the annual scouring of high water, there is little riparian vegetation buildup along the river and in the gorge. There are some tamarisk and willows along the river edge (PNM, 1979).

Comprehensive Resource Management

Less than 1 percent of the Ute Mountain Lands occur in each of the NMDGF herd units in the area. (the Sangre de Cristo Deer Herd Unit, the Maxwell Elk Herd Unit, and the Tres Piedras Antelope Herd Unit. Maps showing these herd units can be found in the 1978 NMDGF publication.)

The Rio Grande Gorge may or may not isolate the antelope south of Ute Mountain from the main herd area in Punche Valley. A recent field observation made by the BLM Taos Resource Area wildlife biologist suggests there is a slight possibility that there is antelope movement across the Rio Grande in the area of Ute Mountain. A local rancher has also seen antelope in the river.

Habitat Diversity

Two of the four biomes [the petran subalpine conifer forest and woodland (Run Wild Identification No. 211.000), and the Great Basin conifer woodland (Run Wild Identification No. 224.000)] occupy small isolated tracts on the Ute Mountain Lands. They constitute the major vegetation on Ute Mountain itself. The plains grassland (Run Wild Identification No. 422.000) and Great Basin desert scrub (Run Wild Identification No. 521.000) biomes occupy much larger tracts of land that extend along the east side of the Rio Grande drainage. These grassland scrub biomes occupy the relatively flat lands covered by the exchange (roughly 70 percent of the Ute Mountain Lands).

The Ute Mountain Lands provide topographic diversity. The major elements of this diversity are the sloping plains at the foot of Ute Mountain, the height of the mountain above the surrounding plain, and the north- and south-facing slopes of the mountain.

Species Diversity

The Ute Mountain Lands include potential habitat for approximately 159 species of wildlife that are not found on the Bisti Lands. Of this number, there are 3 amphibian species, 13 fish species, 100 bird species, 36 mammal species, and 7 reptile species. Of the three amphibian species, one (the western toad) is a state listed species (Group II). None of the 100 species of birds are recovery or listed species; however, 19 are harvest species and, except for the band-tailed pigeon and the common snipe, all are waterfowl. The remaining 81 birds are considered ecosystem maintenance species. The 13 fish species are not listed or recovery species, but six are harvest species. The remaining 7 are ecosystem maintenance species. Two of the 36 mammal species

(the marten and the mink) are recovery or state listed species (Group II). Of the remaining 34 mammals, 13 are harvested either for their fur or their meat (usually a byproduct of sport hunting) leaving 21 mammals that are viewed as ecosystem maintenance species. The 7 reptile species are ecosystem maintenance species.

LAND USES

Right-of-Way Grants

The right-of-way grants listed in Table 2-11 are for structures located on the Bisti Lands.

VISUAL RESOURCES

Bisti Lands

The 27,715 acres of the Bisti Lands, located within six different BLM identified Scenic Quality Rating Units (SQRUs) are shown on Map 2-6. (Refer to the Glossary and to Appendices E-1 and E-2 for further explanation of scenic quality rating.) A majority of the Bisti Lands (approximately 24,835 acres) are within SQRUs 004, 007, and 010, which have been identified as having Class C scenery (of low scenic value).

The Class B scenic value areas in the Bisti Lands involve 687 acres in two rating units; one is SQRU 008, which contains steep escarpments, the other unit (003) contains irrigated farmlands and open grasslands. The prominent land feature of SQRU 008 is Chaco Canyon and its many side canyons, such as Tsaya. This type of landform offers a greater variety in surface relief and coloration than the Class C scenery that surrounds it. There is only a small amount of the Bisti Lands within SQRU 003, and it is gently sloping open grasslands.

The Bisti Badlands, SQRU 006, make up the Class A scenic values. As shown on Map 2-6, 2,193 acres of the Bisti Lands extend into this unit. This extensive area of badlands consist primarily of highly eroded shale and sandstone outcrops, which are generally devoid of vegetation. These formations are striking in that they are enriched and highlighted by early morning sun, sunset coloration and shadow effects. This unit is also considered to be free from aesthetically undesirable influences related to landform alterations or placement of structures on the land. This area is also one of the most extensive badland areas in the San Juan Basin.

Ute Mountain Lands

The lands offered for exchange have not been officially classified. They have been divided into two landscape units, the sagebrush-grassland plain and Ute Mountain. The scenic quality of each of these units is described in the Environmental Resource Evaluation of the Proposed Top O' the World Exchange Lands (PNM 1979), which is excerpted in Appendix E-3. The Rio Grande Gorge, which is adjacent to these lands, has been classified as having Class A scenery values.

TABLE 2-11

RIGHT-OF-WAY GRANTS ON THE BISTI LANDS

Serial Number	R/W	Granted To	Date Granted	Granted For	Rental	Location
NM-3870	150-foot wide road	Bureau of Indian Affairs	August 1969	Indefinite period	—	T. 18 N., R. 12 W., Section 23
NM-12221	20-foot wide transmission line	Jemez Mountain Electric Cooperative	October 1970	50-years	—	T. 24 N., R. 13 W., Section 31 T. 23 N., R. 13 W., Sections 9, 10, 14, 23, and 24 T. 23 N., R. 12 W., Sections 30 and 31 T. 22 N., R. 12 W., Sections 6 and 18
NM-23125	20-foot wide distribution line	Jemez Mountain Electric Cooperative	March 1976	50-years	—	T. 24 N., R. 12 W., Section 31
NM-29324	200-foot wide railroad	Star Lake Railroad Company	September 1980	20-years	$1,542/ Annually	T. 23 N., R. 13 W., Sections 23 and 24 T. 23 N., R. 12 W., Sections 19, 29, and 30 T. 22 N., R. 12 W., Sections 8 and 10
NM-29482	50-foot wide road	New Mexico State Highway Dept.	February 1978	Indefinite period	—	T. 22 N., R. 12 W., Section 6
NM-30797	4 5-foot by[a] 5-foot groundwater observation well sites	U.S. Geological Survey	September 1977	30-years	—	T. 23 N., R. 12 W., Sections 6, 7, and 8
NM-31133 NM-31134 NM-31135	350-foot by 350-foot meteorological sites	PNM	August 1977	3-years[b] (option to renew)	$200/ Annually	T. 23 N., R. 13 W., Sections 10 and 24 T. 23 N., R. 12 W., Section 31
NM-40364	50-foot wide distribution line	PNM	January 1981	50-years	$150/ Annually	T. 18 N., R. 12 W., Section 14
NM-0556114	20-foot wide distribution line	Jemez Mountain Electric Cooperative	August 1965	50-years	—	T. 22 N., R. 12 W., Section 10

Notes: [a] Two additional USGS wells that are not under a right-of-way grant are located in T. 23 N., R. 12 W., Sections 8 and 17.
[b] Actions are being taken by PNM to have these right-of-way grants extended.

R. 13 W. R. 12 W. R. 11 W. R. 10 W.

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
ALBUQUERQUE DISTRICT OFFICE
ALBUQUERQUE, NEW MEXICO

UTE MOUNTAIN EXCHANGE
ENVIRONMENTAL ASSESSMENT

BISTI LANDS
MAP 2-6

T. 24 N.

T. 23 N.

T. 22 N.

T. 18

RESERVATION

INDIAN

NAVAJO

BISTI TRADING POST

Hunter Wash

Wash

Chaco Wash

De-Na-Zin Wash

Coal Creek

371

57

003 B

006 A

004 C

007 C

010 C

008 B

010 C

R.12W.

LEGEND

VISUAL RESOURCES

SCENIC QUALITY RATING UNIT BOUNDARY

SELECTED LAND

CLASS A VISUAL RATING IN BISTI

007 B — SCENIC QUALITY RATING UNIT IDENTIFICATION NUMBER; SCENIC QUALITY RATING

CONTOUR INTERVAL - 20 METERS

NORTH

1 0 1 2 3 MILES

SCALE: 1:126,720

SEPTEMBER 1981

New Mexico State Highway 3 is the major travel route in the area of the Ute Mountain Lands. The 1980 traffic flow study done by the New Mexico State Highway Department indicates an average daily traffic flow of 2,110 vehicles at a point just north of Questa on State Highway 3. Ute Mountain is a focal point as people driving this road look across the plains to the west.

chapter 3

ENVIRONMENTAL CONSEQUENCES

CHAPTER 3

ENVIRONMENTAL CONSEQUENCES

ASSUMPTIONS AND ANALYSIS GUIDELINES

The conveyance of a patent for public land and fee title for private land would not cause impacts in and of itself. Impacts would occur with a change in resource management on both the Bisti and the Ute Mountain Lands. The analysis in this chapter deals only with impacts resulting from a loss or gain of BLM management through a land exchange.

Impacts are addressed for the entire 27,715 acres of the Bisti Lands being considered for exchange. Geology, soils, threatened or endangered plants, topography, and vegetation would not be impacted by the proposed exchange and are not discussed in this chapter.

Under the No Action Alternative, the Bisti Lands would remain in the public domain. BLM management would continue for all of the resource components. Impacts to resource components i.e. paleontological and cultural resources by natural deterioration would continue at their current rate as would the current low level of unauthorized collecting and vandalism. The impacts and mitigation of future actions would be considered and analyzed on a case by case basis.

Mitigating measures are not included in this Final Environmental Assessment (FEA). Therefore, impacts as discussed in this chapter are unmitigated impacts; there would be no residual impacts. Options available to BLM management at the time a decision is made are listed for resource components where they apply.

Once issued, conveyance of a patent and fee title for these lands would result in a change in ownership and management; therefore, only the long-term impacts on the areas and resources management programs are considered in this FEA.

Ownership and management of the lands could revert back to the former land holders. This action is not likely and the proposed land exchange is, therefore, considered to be irreversible and any of the resource components transferred in the proposed exchange are considered irretrievable.

PALEONTOLOGY

Bisti Lands

The BLM could lose control and management of a portion of the paleontological sites listed in Table 2-1. The following impacts could occur:

1. Scientific study of paleontological sites could not occur.

2. Fossil-collecting localities could be closed to the scientific community, hindering the discovery of new fossils exposed by weathering.

MINERALS

Bisti Lands

Leaseables

Coal. The lessee(s) would cause surface disturbances on private land in the development of leases. Section 209 of the Federal Land Policy and Management Act (FLPMA) does not provide for reimbursement to the land owner for surface disturbances due to mineral entry.

Until leases are issued for coal that can be competitively leased a change in surface ownership could result in providing an advantage to the new surface owner in bidding for leases. Potential conflicts of new lessee(s) in developing leases on land under private ownership could occur.

Management Option

Coal. Delay a decision on exchanging the lands identified (in P.L. 96-475) for the coal lease exchange and lands identified for potential competitive leasing in the Chaco Planning Unit MFP (Map 2-2) until competitive leases are issued.

Oil and gas. A standard operating procedure, as listed in Table 1-3, reserves the lessee(s) right to surface resources when developing leases. The lessee(s) would cause surface disturbances on private land in the development of leases. Section 209 of the FLPMA does not provide for reimbursement to the land owner for surface disturbances due to mineral entry.

Locatables

A standard operating procedure (as listed in Table 1-3) reserves Phillips' right to patent their mining claims. Phillips would be able to patent the surface estate of their mining claims after an exchange. A maximum of 2,009 acres of land could later be lost by Paragon, if acquired in the proposed exchange.

The claimant would cause surface disturbances on private land in the development of mining claims. Section 209 of FLPMA does not provide for reimbursement to the land owner for surface disturbances due to mineral entry.

Claims could still be staked on the land, as the federal minerals would remain under federal management.

Saleable Minerals

At present, there are no saleable mineral deposits being developed on the Bisti Lands; however, the BLM could conduct non-competitive sales (under $5,000) and the buyer would be required to reimburse the surface owner for any surface damage. A competitive sale (over $5,000) could only be made if the surface owner agreed to grant access to any individual or group who bought the minerals.

Access

Existing and future claimants and lessees have access to federal minerals. The public can continue to stake claims or obtain leases.

Ute Mountain

Surface reclamation requirements may not apply to Paragon and Mr. A. K. McMillan for mineral exploration and development activities related to saleable minerals, i.e., the cinder pit. (There are no locatable or leaseable minerals.) An opinion from the solicitor has been requested on this point. Mr. A. K. McMillan has access to all of the Ute Mountain Lands. Surface-disturbing activities could occur along the river even under federal ownership and management.

Management Option

BLM negotiate and obtain a scenic easement from Mr. A. K. McMillan for a quarter-mile wide stretch of land along the river.

WATER RESOURCES

Bisti Lands

The standard operating procedure for exchanging lands with floodplains is listed in Table 1-3. Management opportunities for water resources, designated floodplains, and the reduction of sediment yields from the Bisti Lands could be lost. Wells may need to be removed in an exchange of Bisti Lands. Reimbursement, at current value, would be made to the owner by Paragon for any wells that could not be removed from the land.

Management Option

Drill new wells on adjacent public lands.

If U. S. Geological Survey (USGS) and livestock operators apply for a Right-of-Way (ROW) permit to the wells prior to an exchange, a clause would be placed in the patent to reserve access to wells.

SOCIAL AND ECONOMIC FACTORS

Bisti Lands

Based on Fiscal Year 1980 figures, the payments to the counties in lieu of taxes would be reduced by approximately 71 cents per acre for each acre exchanged.

The loss of grazing by public land users could also constitute an economic impact. The assignment of dollar values to grazing is complicated by the lack of data on beef or mutton production per animal unit month (AUM) of grazing, etc. The following figures give a range of estimated values.

The amount ranch operators pay for an AUM of grazing is an indication of its value. Currently, operators are paying $2.31 for an AUM of public land grazing. The average monthly rate per head for pasturing cattle on privately owned land in New Mexico was $6.70 in 1979. Using 1979 New Mexico agricultural statistics, the gross return per AUM of grazing was estimated at $16.49 (refer to Appendix G).

Two of the allotments would continue to be used by the present operator, Paragon. Paragon would no longer be required to pay grazing fees for lands selected in an exchange or follow BLM livestock management policy. The other allotment (264 AUMs) is used by Phillips Uranium, who has other economic interests. Four other allotments are used by nine Navajo livestock operators. Therefore, the economic impact to Phillips Uranium would be less severe than the impacts to the nine Navajo operators who use the other four allotments.

The BLM could lose the annual revenue from grazing permits for a portion of 2,855 AUMs. In 1981, the annual revenue for the 2,855 AUMs amounted to approximately $6,595.

Up to $1,542 of the annual rental on the Star Lake Railroad right-of-way presently being received by the BLM would be paid to the new surface owner. Annual rental fees of $200 for meterological sites and $150 for an electrical distribution line (paid to the BLM by PNM) could be terminated.

A change in the surface ownership of the Bisti Lands would eliminate the federal government's ability to ensure access to burial sites and sites used by the Navajo for religious and ceremonial purposes. The Proposed Action could eliminate the free availability of herbs and sandstone. A gathering site for these items is located near Crane Petroglyphs. Even if they could be gathered free in other areas, there would be transportation costs.

Disturbance of burial sites in the exchange area would result in emotional impacts on the resident Navajo people.

Ute Mountain Lands

Economically, the county would no longer receive the tax revenue paid by Paragon (approximately $1,025 in 1980). Acreage held in federal ownership in Taos County (called Entitlement Acres) brought in an average of 63 cents per acre as in-lieu tax payments for fiscal year 1980. Based on the 63 cents per acre figure, the 17,138 acres of exchange lands would generate in-lieu payments amounting to $10,796.94 at the 1980 rate. This would be a net increase in county revenue.

LIVESTOCK

Bisti Lands

The livestock allotments for the nine Navajo operators could be eliminated. Relocation of the grazing preference of Navajo operations lost

because of the exchange is not possible, as all public land grazing use areas in the Chaco vicinity are presently allocated for grazing.

A portion of the federal grazing preference on the Tsaya Allotment (1,533 AUMs) and 391 AUMs on the Black Lake Allotment could be eliminated from further BLM management and would result in the elimination of grazing fees on these lands. A maximum of 264 AUMs on the allotment leased by Phillips Uranium could be eliminated. (Refer to the Social and Economic Factors section of this chapter for dollar values of AUMs).

The disposal of a portion of the public lands within an allotment could result in limiting the BLM's management ability on the remaining public lands in that allotment particularly the Tsaya Allotment (6012) in which an Allotment Management Plan (AMP) was initiated in 1970.

Range development projects that could be acquired, if not removed from exchange lands, consist of two BLM wells, 1 reservoir, and 4.5 miles of fence. (The standard operating procedure for developments that cannot be removed from the land is listed in Table 1-3.)

Management Option

Select other lands in the Bisti area prior to selecting any of the lands in the nine Navajo grazing allotments.

Ute Mountain Lands

If these lands come into public ownership, any grazing allowed on them would be administered under Title 43 CFR, Part 4100. The lands would be outside an existing grazing district; thus, base property for public land grazing preference would be "contiguous land, or noncontiguous land when the applicant owns or controls contiguous land" (43 CFR 4110.2-1(a)(2)).

The area is presently inadequately watered for sheep, and fences and water developments would be needed for cattle. Also, a large acreage (approximately 8,160 acres or 62 percent) is in poor condition (refer to Table 3-1). Until some of the basic facilities and developments were constructed, grazing use of the proposed 982 AUMs would not occur.

CULTURAL RESOURCES

Bisti Lands

Standard operating procedures for cultural resources are listed in Table 1-3. Cultural resource consultation and coordination requirements are listed in Chapter 4.

Under the Proposed Action, the federal government would give up control and management over cultural resources on the Bisti Lands, which could include the Crane Petroglyphs. Existing federal laws requiring analysis of impacts on archeological sites prior to ground-disturbing activities would not apply.

American Indian gravesites, sacred sites, and gathering areas on the Bisti Lands could also pass from the jurisdiction of the federal government.

TABLE 3-1

RANGE SITES, CONDITION AND PRODUCTION DATA FOR
UTE MOUNTAIN VEGETATION

Range Site	Total Acres	Condition and Production [a] Good	Fair	Poor
Pinyon-Juniper-Dense	48	---	48A 60 lb./A	---
Pinyon-Juniper-Medium	228	---	228A 185 lb./A	---
Pinyon-Juniper-Sparse	560	---	560A 250 lb./A	---
Coarse Loamy	2,424	---	---	2,424A 33 lb./A
Gravelly Loam	1,189	---	---	1,189A 45 lb./A
Loamy	692	72A 176 lb./A	440A 110 lb./A	180A 55 lb./A
Loamy Bottom	209	---	---	209A 57 lb./A
Stony Loam	367	354A 150 lb./A	13A 95 lb./A	---
Dry Loamy		22A 67 lb./A	759A 47 lb./A	---
Malpais Loam	186	---	186A 124 lb./A	---
Malpais	155	155A 96 lb./A	---	---
Dry Limy	1,301	759A 255 lb./A	542A 105 lb./A	---
Limy	621	---	621A 129 lb./A	---
Gravelly Fan	3,593	---	9A 48 lb./A	3,584A 24 lb./A
Breaks	560	---	131A 86 lb./A	429A 29 lb./A
Swale	145	---	---	145A 78 lb./A
Subtotal	13,059	1,362A (11%)	3,537A (27%)	8,160A (62%)
Conifer-Woodland [b]	4,075			
GRAND TOTAL	17,134			

Notes: [a] Pounds per acre is currently available production.
[b] This area was not inventoried due to steepness of slope and unsuitability.

American Indians could be excluded from sacred areas; however, the BLM lacks the data to assess these impacts. Disturbances to gravesites may be regulated by existing state law.

Ute Mountain Lands

Acquisition of these lands would provide the BLM with the opportunity to conduct inventories and manage cultural resources on Ute Mountain Lands.

WILDERNESS

Bisti and Ute Mountain Lands

A loss of federal management would occur for lands selected adjacent to WSAs. Acquisition of Ute Mountain would provide the opportunity to intensively inventory the Ute Mountain Lands and possibly add a WSA.

RECREATION

Bisti Lands

The proposed exchange could result in the closing of land used by the general public. The removal of the Bisti Lands from public use would not create impacts on dispersed recreation. This closure would shift or displace recreation use to other federal lands in the San Juan Basin. The effect of this shift to the individual user cannot be quantified, because the current recreational use or demand for these lands has not been measured.

Field excavation of fossils in the Fossil Forest could afford the recreationist the opportunity to view professional paleontologists at work. Exact visitor demand for this type of recreation is not known at this point; however, the Florissant Fossil Bed National Monument in Florissant Colorado, also situated in a remote location, received over 66,600 visitors in 1980. (Pers. comm. with Myrtle Weir, NPS March 1981.) The transfer of this type of resource to private ownership could result in the loss of this recreation to the public.

Ute Mountain Lands

Acquisition of Ute Mountain would provide the BLM with management opportunities related to recreational activity for fishing, sightseeing, ORV, hiking, rock collecting and cross country skiing occurring along the Rio Grande and primitive type recreation development of trails on Ute Mountain.

WILDLIFE

Bisti Lands

Listed wildlife species. The standard operating procedure for listed wildlife species is shown in Table 1-3.

Management Option

The selection of tracts with habitat for listed species identified during Section 7 clearance may have to be modified to eliminate land from the exchange.

Comprehensive resource management. The loss of a small amount of antelope habitat on the Bisti Lands could occur.

Management Option

Ensure better water availability (e.g. rain catchments), fencing built to antelope specifications, and adequate forage allocation on BLM lands not selected in an exchange.

Habitat diversity. The topography of the Bisti Lands is essentially open, flat to rolling plains. Therefore, the Bisti Lands have less potential for local habitat variations resulting from differences in elevation and exposure (north or south-facing slopes). The lower the variety of wildlife habitats, the lower the potential variety of wildlife species present.

Diversity values and management options. Habitat for listed species on the Bisti Lands may not be lost. Habitat managment for two furbearer/harvest species (the kit fox and Eastern spotted skunk) could be lost. Habitat management for the remaining 19 out of a total of 21 wildlife species could be lost for ecosystem maintenance species (refer to Glossary).

Ute Mountain Lands

Listed wildlife species. Aquisition of these lands would permit federal management for both bald eagles and peregine falcons. This is particularly important in regard to these two scarce but highly mobile species, because favorably managed habitat offers the opportunity for recolonization.

The probability of the occurrence of the black-footed ferret on the Ute Mountain Lands is remote, but if the black-footed ferret is found to occur, BLM management of the land would have to ensure protection for its habitat.

While the presence of the western toad, marten and mink (state listed) is not confirmed, the acquisition of the Ute Mountain Lands would permit the BLM to develop management actions which include consideration of these species.

Comprehensive resource management. The Ute Mountain Lands provide habitat for mule deer, elk, and antelope. Acquisition of these lands would permit the BLM to manage the lands for the benefit of these species. These lands contain less than 1 percent of each of the herd units for each of these species. The production of a given harvest animal species from the Ute Mountain Lands would be low when compared to those produced by the rest of its herd unit. However, the Ute Mountain Lands have particular value for nonhunting wildlife-oriented recreation, because the potential for seeing all three big game species occurs within a relatively small geographic area. The potential for intensifying production of big game numbers on this small "blocked-up" unit of land is good; e.g., rain catchments could be constructed to provide year-round water for big game. Management for hunter use would be secondary, as this relatively small block of land does not contain large quantities of habitat for any big game species.

Habitat diversity. None of the four biomes are particularly scarce in New Mexico, although the petran subalpine conifer appears to be the least abundant statewide (USFS, 1980).

Diversity values and management options. Habitat management by the BLM for about 159 additional wildlife species could occur. Of these, 41 species would be of special social interest. Three of these are listed or recovery species and 38 are harvest species, either game animals or furbearers.

LAND USES

Bisti and Ute Mountain Lands

A standard operating procedure, as shown in Table 1-3 reserves the rights of the grantee for the Right-of-Way grants listed in Chapter 2. Upon conveyance of any of the exchange lands, future right-of-way needs would be negotiated with Paragon.

Conveyance of any of the Bisti Lands to private ownership would result in the loss of rental payments to the BLM. The loss of revenue derived from the right-of-way grants would occur for both present and future rights-of-way. (Refer to the Social and Economic Factors section of this chapter for the amount of this revenue.)

Rights-of-way on the Ute Mountain Lands would be processed and granted according to BLM regulations and requirements.

VISUAL RESOURCES

Bisti and Ute Mountain Lands

Through the exchange, the BLM could lose management authority of a maximum of 2,193 acres in the highly scenic Class A lands of the Bisti area, a rare area in the San Juan Basin. The remaining 25,522 acres of the Bisti Lands are considered to be from moderate to low in scenic value and similar to other areas in the San Juan Basin.

The BLM would gain management authority over a block of land featuring two distinct landscape units. Based on the written description of these lands in Appendix F-3, the sagebrush-grassland unit is considered to have Class C scenic values and Ute Mountain Class B scenic values. These projected classes are based on a preliminary application of the BLM scenic quality inventory and evaluation chart.

appendices

APPENDIX A-1

LEGAL DESCRIPTION FOR BISTI LANDS

Description		Acres
T. 18 N., R. 12 W.		
Section 2:	Lots 1, 2, 3, 4, $S^1/2NW^1/4$, $SW^1/4$	409.52
Section 11:	All	640.00
Section 14:	$N^1/2$	320.00
Section 23:	All	640.00
T. 22 N., R. 12 W.		
Section 4:	Lots 1, 2, 3, 4, $S^1/2N^1/2$, $S^1/2$	639.28
Section 6:	Lots 1, 2, 3, 4, 5, 6, 7, $S^1/2NE^1/4$, $SE^1/4NW^1/4$, $E^1/2SW^1/4$, $SE^1/4$	635.20
Section 8:	$N^1/2$	320.00
Section 10:	All	640.00
Section 18:	Lots 1, 2, 3, 4, $NE^1/4$, $E^1/2W^1/2$	476.08
T. 22 N., R. 13 W.		
Section 24:	$E^1/2NE^1/4$	80.00
T. 23 N., R. 12 W.		
Section 6:	Lots 8 through 23	679.36
Section 7:	Lots 5 through 19	630.79
Section 8:	Lots 1 through 14	594.74
Section 9:	Lots 1, 2, 3, and 4	170.32
Section 12:	Lots 1 through 16	674.32
Section 13:	Lots 1 through 16	666.65
Section 14:	Lots 1 through 8, $NW^1/4$	491.95
Section 17:	Lots 1 through 13	545.92
Section 18:	Lots 5 and 6	84.28
Section 19:	Lots 5 through 20	654.71
Section 20:	Lots 1 through 16	662.30
Section 21:	Lots 1 through 16	663.45
Section 22:	Lots 1 through 16	661.31
Section 23:	Lots 1, 2, 3, 4, 5, 6, 7, 8, $S^1/2$	649.63
Section 24:	Lots 1, 2, 3, 4, 5, 6, 7, 8, $S^1/2$	650.20
Section 26:	All	640.00
Section 28:	All	640.00
Section 29:	All	640.00
Section 30:	Lots 1, 2, 3, 4, $E^1/2$, $E^1/2W^1/2$	635.32
Section 31:	Lots 1, 2, 3, 4, $E^1/2$, $E^1/2W^1/2$	635.28
Section 34:	All	640.00

APPENDIX A-1 (concluded)

Description		Acres
T. 23 N., R. 13 W.		
Section 1:	All	640.00
Section 6:	Lots 1, 2, 3, 4, $E^1/2$, $E^1/2W^1/2$	522.92
Section 7:	Lots 1, 2, 3, 4, 5, $E^1/2NW^1/4$, $NE^1/4SW^1/4$	160.41
Section 9:	Lots 1, 2, $N^1/2SE^1/4$	166.80
Section 10:	Lots 1, 2, 3, 4, $N^1/2$, $N^1/2S^1/2$	653.36
Section 11:	Lots 1, 2, 3, 4, $N^1/2$, $N^1/2S^1/2$	650.28
Section 12:	Lots 1, 2, 3, 4, $N^1/2$, $N^1/2S^1/2$	643.52
Section 13:	$NW^1/4$, $S^1/2$	480.00
Section 14:	All	640.00
Section 15:	$NW^1/4$	160.00
Section 20:	$SE^1/4SE^1/4$	40.00
Section 22:	$S^1/2SW^1/4$	80.00
Section 23:	All	640.00
Section 24:	All	640.00
Section 26:	All	640.00
Section 28:	All	640.00
T. 24 N., R. 11 W.		
Section 21:	$S^1/2$	320.00
Section 22:	$S^1/2$	320.00
Section 27:	All	640.00
Section 28:	All	640.00
Section 33:	$N^1/2$	320.00
Section 34:	$N^1/2$	320.00
T. 24 N., R. 12 W.		
Section 31:	Lot 17	42.15
T. 24 N., R. 13 W.		
Section 31:	Lots 1, 2, 3, 4, $E^1/2$, $E^1/2W^1/2$	525.57
Section 36:	$S^1/2SE^1/4$	80.00

APPENDIX A-2

LEGAL DESCRIPTION FOR UTE MOUNTAIN LANDS

A certain tract of land near Costilla, Taos County, New Mexico, described as part of the westerly portion of the Sangre de Cristo Land Grant and part of Sections 7, 8 and part of Section 6, Township 1 South, Range 73 West, part of Sections 1 and 2, all of Sections 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 15, 16, 17, 18, 19, 20, 21, 22, 27, 28, 34 and part of Sections 14, 23, 26, 29, 35, 30, 32 and 33, Township 1 South, Range 74 West, part of Sections 3 and 4, Township 2 South, Range 74 West, of a private survey for the Costilla Estate Development Company by T. C. McPherson, as shown on a Map of Sectionizing filed in the Taos County Courthouse on May 11, 1920; and further described by metes and bounds as follows:

TRACT "A" BEGINNING at the southwest corner of the Sangre de Cristo Land Grant, a 1943 U.S.G.L.O. brass cap monument found, thence;
West, 368.0 feet to Point 1 on the centerline of the Rio Grande, thence upstream along the centerline of said rio the following meander courses;
N. 01° 48' E., 901.0 feet to Point 2, thence;
N. 38° 00' E., 680.5 feet to Point 3, thence;
N. 19° 43' W., 926.6 feet to Point 4, thence;
N. 38° 29' E., 1824.2 feet to Point 5, thence;
N. 64° 26' E., 2034.9 feet to Point 6, thence;
N. 35° 45' E., 274.4 feet to Point 7, thence;
N. 04° 57' E., 627.9 feet to Point 8, thence;
N. 42° 05' E., 1020.2 feet to Point 9, thence;
N. 12° 17' E., 983.0 feet to Point 10, thence;
N. 11° 51' E., 1195.3 feet to Point 11, thence;
N. 65° 01' E., 420.4 feet to Point 12, thence;
N. 71° 54' E., 127.7 feet to Point 13, thence;
N. 23° 22' E., 408.3 feet to Point 14, thence;
N. 29° 19' W., 613.7 feet to Point 15, thence;
N. 00° 08' E., 657.0 feet to Point 16, thence;
N. 38° 52' W., 306.3 feet to Point 17, thence;
N. 44° 02' W., 354.6 feet to Point 18, thence;
N. 17° 56' E., 242.3 feet to Point 19, thence;
N. 36° 55' E., 372.2 feet to Point 20, thence;
N. 25° 23' W., 1085.5 feet to Point 21, thence;
N. 10° 54' E., 1063.2 feet to Point 22, thence;
N. 25° 30' E., 687.4 feet to Point 23, thence;
N. 28° 31' E., 302.2 feet to Point 24, thence;
N. 52° 15' E., 236.6 feet to Point 25, thence;
N. 10° 24' W., 1157.3 feet to Point 26, thence;
N. 22° 55' W., 1151.6 feet to Point 27, thence;
N. 00° 35' W., 768.2 feet to Point 28, thence;
N. 13° 31' E., 254.7 feet to Point 29, thence;
N. 00° 04' W., 855.2 feet to Point 30, thence;
N. 35° 57' E., 454.5 feet to Point 31, thence;
N. 25° 34' E., 215.4 feet to Point 32, thence;
N. 21° 51' W., 574.8 feet to Point 33, on the New Mexico Colorado State Line, thence leaving the centerline of the Rio Grande and along the state boundary line;
N. 89° 55' E., 250.0 feet to the 147 + 70.58 mile marker, a 1925 U.S. Government brass cap monument set in concrete found, thence;
N. 89° 55' E., 4655.2 feet to the 147 mile marker a 1925 U.S. Government brass cap monument set in concrete found, thence;
N. 89° 58' E., 5364.9 feet to a scribed stone found for the 146 mile marker, thence;
N. 89° 52' E., 5279.6 feet to a 2 inch iron pipe found for the 145 mile marker, thence;
N. 89° 55' E., 5280.0 feet to the 144 mile marker, a 1928 U.S. Government brass cap set in concrete found, thence;
N. 89° 42' E., 5191.5 feet to the 143 mile marker, a 1928 U.S. Government brass cap set in concrete found, thence;
S. 88° 24' E., 431.0 feet to the 142 + 75 mile marker, a 1928 U.S. Government brass cap monument set in concrete found, thence leaving the New Mexico Colorado State Line;
S. 00° 09' W., 2644.4 feet to a scribed stone 1/4 corner found, thence;
S. 00° 12' E., 7917.8 feet to a 1/2 inch rebar set, thence;
S. 00° 01' E., 4285.5 feet to a point, thence;
S. 89° 47' W., 970.3 feet to a point, thence;
S. 00° 01' E., 984.6 feet to a point, thence;
S. 89° 47' W., 2979.6 feet to a 1/2 inch rebar set, thence;
S. 00° 01' E., 5295.2 feet to a 1/2 inch rebar set, thence;
S. 00° 01' E., 5274.2 feet to a 1/2 inch rebar set, thence;
S. 00° 01' E., 5274.2 feet to a 1/2 inch rebar set, thence;
N. 89° 56' W., 3513.7 feet to a 1/2 inch rebar set, thence;
S. 00° 04' W., 3651.6 feet to the S.E. corner of this tract a 1/2 inch rebar set on the southerly boundary of the Sangre de Cristo Land Grant from whence the S 1/2 Mile Marker, a 1943 U.S.G.L.O. brass cap monument found bears S. 55° 43' E., 993.1 feet distant, thence along said grant boundary;
N. 55° 43' W., 1646.3 feet to the 5 Mile Marker, a 1943 U.S. G.L.O. brass cap monument found, thence;
N. 55° 31' W., 132.1 feet to the closing corner between Sections 27 and 28, T. 31 N., R. 12 E., N.M.P.M., a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 55° 45' W., 270.3 feet to the closing corner between Sections 21 and 28, T. 31 N., R. 12 E., N.M.P.M., a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 55° 32' W., 2218.5 feet to the 4 1/2 Mile Marker, a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 55° 36' W., 2619.3 feet to the 4 Mile Marker, a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 55° 47' W., 1330.2 feet to the closing corner between Sections 20 and 21, T. 31 N., R. 12 E., N.M.P.M., a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 55° 46' W., 1328.2 feet to the 3 1/2 Mile Marker, a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 55° 46' W., 2005.3 feet to the closing corner between Sections 17 and 20, T. 25 N., R. 12 E., N.M.P.M., a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 55° 56' W., 654.0 feet to the 3 Mile Marker, a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 56° 19' W., 2332.5 feet to the closing corner between Sections 17 and 18, T. 31 N., R. 12 E., N.M.P.M., a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 54° 40' W., 338.4 feet to the 2 1/2 Mile Marker, a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 55° 51' W., 2670.4 feet to the 2 Mile Marker, a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 55° 28' W., 2656.6 feet to the 1 1/2 Mile Marker, a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 55° 28' W., 724.7 feet to the closing corner between Section 18, T. 31 N., R. 12 E., N.M.P.M. and Section 13, T. 31 N., R. 11 E., N.M.P.M., a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 56° 09' W., 54.2 feet to the closing corner between Sections 13 and 12, T. 31 N., R. 11 E., N.M.P.M., a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 55° 23' W., 1882.2 feet to the 1 Mile Marker, a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 55° 16' W., 2645.9 feet to the 1/2 Mile Marker, a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 55° 17' W., 1858.3 feet to the closing corner between Sections 11 and 12, T. 31 N., R. 11 E., a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 55° 17' W., 792.7 feet to the point and place of beginning.

This tract contains 17,134.555 acres, more or less.

Source: PNM, 1979.

APPENDIX A-3

PARAGON RESOURCES, INC.
4500 Bogan Road NE
Albuquerque, New Mexico 87109
505-842-4778

August 14, 1981

L. Paul Applegate,
District Manager
Bureau of Land Management
United States Department
of the Interior
Post Office Box 6770
Albuquerque, New Mexico 87107

Subject: Ute Mountain Land Exchange

Dear Mr. Applegate:

I am writing in connection with the comtemplated Ute Mountain Land Exchange, pursuant to which Paragon Resources, Inc., ("Paragon") proposes to acquire from the BLM title to the surface of certain land in the Bisti Area of northwestern New Mexico (the "Exchange Land"). The Exchange Land includes some or all of the land (the "PRLA Land") that is covered by certain outstanding Preference Right Lease Applications ("PRLAs").

This letter will confirm our agreement that Paragon will not deny to the holders of the PRLAs access over the Exchange Land to the PRLA Land, subject to reasonable restrictions as to routes and manner and purpose of use, and further subject to the payment of such surface damages as are permitted by law.

Very truly yours,

PARAGON RESOURCES, INC.

Robert B Rountree

BY: R. B. Rountree
President

APPENDIX B

DEFINITIONS FOR IMPORTANCE VALUES ASSIGNED
TO FOSSIL OCCURRENCES

Class I CRITICAL/MITIGATION OR PROTECTION ESSENTIAL

This class includes any locality containing fossils that, by their rarity or exceptionally good or complete preservation, will add considerably to knowledge of the paleobiology, morphology, stratigraphic or geographic distribution, or paleoenvironment of the fossil organisms. Such localities often contain a great abundance of ordinarily rare taxa, fossils new to science, parts of fossil organisms that have not been known previously and/or unusual or unique *in situ* assemblages of fossils. Mitigation of these sites is essential because of the great amount of new paleontological information they contain. Depending on the size and type of deposit, mitigation may include total protection, or salvage through large scale surface collecting, excavation or bulk sediment sampling for screening purposes; or salvage may be limited to a statistically valid sample of all forms present.

Class II HIGHLY IMPORTANT/MITIGATION STRONGLY RECOMMENDED

These are localities containing fossil materials that significantly extend our knowledge of the morphology, paleobiology, stratigraphic or geographic distribution, or paleoecology of a species or assemblage. Highly Important sites generally contain numerous surface deposits that suggest more extensive or important remains would be revealed by intensive collecting and excavation. In some cases, beautifully preserved single specimens, such as a complete dinosaur bone or turtle carapace would also be considered Highly Important. High surface concentrations of small fossils, such as fish scales, reptile teeth, or freshwater molluscs, which suggest that bulk screening would produce hundreds or thousands of additional specimens are likewise Highly Important. Mitigation is strongly recommended for these sites and would consist of salvage similar to that recommended for the Critical localities. In most cases valid statistical samples would probably suffice but for rare species as much material as possible should be collected.

Class III IMPORTANT/MITIGATION RECOMMENDED

Important localities contain fossil materials that are relatively plentiful, common near the locality and elsewhere, and provide useful information for stratigraphic, geographic or variability studies. Single well preserved skeletal parts that are known from other specimens but worthy of examination or display are also in this category. Mitigation would generally be limited to a statistically valid sample of the fossils at the locality; large scale excavation or screening would rarely be needed.

Class IV INSIGNIFICANT/MITIGATION OPTIONAL

These localities contain fossils that are very poorly preserved, fragmented or undiagnostic and that are common elsewhere. Such localities provide minimal new information and show no indication that additional collecting, excavation or screening would provide additional material of value. Mitigation is optional and would be limited to sites that are near more important deposits.

Source: Kues, et al. 1977.

APPENDIX C

LEGAL DESCRIPTION AND SERIAL NUMBER OF OIL AND GAS LEASES ON BISTI LANDS

Legal Description	Serial No.
T. 18 N., R. 12 W., Sec. 14	NM 14427
T. 22 N., R. 12 W., Sec. 4	NM 19569
	NM 25848
	NM 34192
Sec. 6	NM 25848
Sec. 8	NM 25849
Sec. 10	NM 16764
	NM 19569
Sec. 18	NM 35318
T. 22 N., R. 13 W., Sec. 24	NM 18466
	NM 35119
T. 23 N., R. 11 W., Sec. 3	NM 34601
T. 23 N., R. 12 W., Sec. 6	NM 43068[a/]
Sec. 7	NM 35320
Sec. 8	NM 35320
Sec. 9	NM 15846
Sec. 12	NM 35568
Sec. 13	NM 35568
Sec. 14	NM 35568
	NM 27436
Sec. 17	NM 18465
T. 23 N., R. 12 W., (Cont'd)	
Sec. 18	NM 36357
Sec. 19	NM 32544
Sec. 20	NM 23240
	NM 36357
Sec. 21	NM 18465
	NM 25042
Sec. 23	NM 25327
	NM 25041
Sec. 24	NM 25041
Sec. 26	NM 24979
Sec. 28	NM 23240[b/]
	NM 33389
Sec. 29	NM 38288
Sec. 30	NM 17017
Sec. 31	NM 18951
Sec. 34	NM 25043
	NM 24980
T. 23 N., R. 13 W., Sec. 6	NM 26832
Sec. 7	NM 27608
T. 23 N., R. 13 W., (Cont'd)	
Sec. 13	NM 29348
	NM 32366
Sec. 14	NM 30354
	NM 40211
Sec. 15	NM 38290
Sec. 20	NM 15659
Sec. 23	NM 32366
Sec. 24	NM 19572
Sec. 26	NM 26355
Sec. 28	NM 26833
T. 24 N., R. 11 W., Sec. 22	NM 25846
	NM 32125
	NM 17192
	NM 14100
Sec. 27	NM 19160
Sec. 28	NM 19160
Sec. 33	NM 25847
	NM 29344
Sec. 34	NM 35118
T. 24 N., R. 13 W., Sec. 31	NM 26663

Notes: [a/] Application for oil and gas lease.
[b/] Sublease of NM 23240 lease.

APPENDIX D

PRINCIPAL ARCHEOLOGICAL INVENTORIES ON THE SELECTED LANDS

Contract Holder	Supervising Archeologist and Date of Report	Contracting Organization	Area of Inventory	Number of Acres Inventoried for Cultural Resources
Cultural Resource Management Program, New Mexico State University, San Juan Campus, Farmington, New Mexico.	R.B. Groves 1976	Eastern Associated Coal Corporation	T. 23 N., R. 12 W., Sec. 24.	640
Cultural Resource Management Program, New Mexico State University, San Juan Campus, Farmington, New Mexico.	Billy J. Naylor 1976	Ark Land Company	T. 23 N., R. 12 W., Secs. 21[a], 22, 23[a], 26[a], 27, 28.	2,600
Division of Conservation Archaeology, San Juan County Archaeological Research Center and Library, Farmington, New Mexico.	Margaret A. Powers 1979	Public Service Company of New Mexico	T. 23 N., R. 13 W., Secs. 13[a], 14, 23, 24.	2,432
Archaeological Associates Inc., Boulder, Colorado.	Hannah Huse, B.A. Noisat, and J.A. Halasi 1978	Bureau of Land Management, Albuquerque District	T. 22 N., R. 12 W., Sec. 4; T. 23 N., R. 12 W., Sec. 31; T. 23 N., R. 13 W., Sec. 26; T. 24 N., R. 11 W., Sec. 33[b].	2,240
Division of Conservation Archaeology, San Juan County Archaeological Research Center and Library, Farmington, New Mexico.	Mark Ganas 1980	Western Coal Company	T. 23 N., R. 13 W., Secs. 1[a], 9[a], 10[a], 11[a], 12.	2,160
ESCA-TECH Corporation, Costa Mesa, California.	Craig Baker, Steven E. Sessions, and Mark Ganas 1981	Bureau of Land Management, Albuquerque District	T. 23 N., R. 12 W., Secs. 19, 20.	1,280
			TOTAL	11,352

Source: BLM Albuquerque District Archeological Site Files.

Notes: [a] Only a portion of this section was included in the inventory.
[b] The entire section was inventoried, but only the N1/2 is within the selected lands.

APPENDIX E-1

INVENTORY/EVALUATION RATING CRITERIA AND SCORE

Scenic Quality

Scenic Quality is perhaps best described as the overall impression retained after driving through, walking through, or flying over an area of land. In the VRM process, rating Scenic Quality requires a brief description of the existing scenic values in a landscape. This step identifies (1) areas that must be protected, (2) opportunities for enhancement and rehabilitation, and (3) opportunities for improvement by reducing the contrast of cultural modifications.

When inventoried, an area is first divided into subunits that appear homogeneous, generally in terms of landform and vegetation. Each area is then rated by seven Key Factors: landform, vegetation, water, color, influence of adjacent scenery, scarcity, and cultural modification. A standardized point system assigns great, some, or little importance to each factor. The values for each category are calculated and, according to total points, three Scenic Quality Classes are determined and mapped:
Class A Areas that combine the most outstanding characteristics of each rating factor (19-33 points).
Class B Areas in which there is a combination of some outstanding features and some that are fairly common to the physiographic region (12-18 points).
Class C Areas in which the features are fairly common to the physiographic region (0-11 points).

Landform	Vegetation	Water	Color	Adjacent Scenery	Scarcity	Cultural Modifications
High vertical relief such as prominent cliffs, spires or massive rock outcrops, **or** severe surface variation or highly eroded formations including major badlands or dune systems **or** detail features dominant and exceptionally striking and intriguing such as glaciers. **5**	A variety of vegetative types in interesting forms, textures, and patterns. **5**	Clear and clean appearing, still, or cascading white water, any of which are a dominant factor in the landscape. **5**	Rich color combinations, variety or vivid color; **or** pleasing contrasts in the soil, rock, vegetation, water or snow fields. **5**	Adjacent scenery greatly enhances visual quality. **5**	One of a kind; **or** unusually memorable; **or** very rare within region. Consistent chance for exceptional wildlife or wildflower viewing. **6**	Free from esthetically undesirable or discordant sights and influences; **or** modifications add favorably to visual variety. **2**
Steep canyons, mesas, buttes, cinder cones and drumlins; **or** interesting erosional patterns or variety in size and shape of landforms **or** detail features present and interesting though not dominant or exceptional. **3**	Some variety of vegetation, but only one or two types. **3**	Flowing or still, but not dominant in the landscape. **3**	Some intensity or variety in colors and contrast of the soil, rock and vegetation, but not a dominant scenic element. **3**	Adjacent scenery moderately enhances overall visual quality. **3**	Distinctive, though somewhat similar to others within the region. **2**	Scenic quality is somewhat depreciated by inharmonious intrusions, but not so extensively that they are entirely negated; **or** modifications add little or no visual variety to the area. **0**
Low, rolling hills, foothills **or** flat valley bottoms. Interesting detailed landscape features few or lacking. **1**	Little or no variety or contrast in vegetation. **1**	Absent, or not noticeable. **0**	Subtle color variations, contrast or interest; generally muted tones. **1**	Adjacent scenery has little or no influence on overall visual quality. **0**	Interesting within its setting, but fairly common within the region. **1**	Modifications are so extensive that scenic qualities are mostly nullified or substantially reduced. **-4**

SCENIC QUALITY
A= 19-33
B= 12-18
C= 0-11

Source: Visual Resource Management Program BLM, Washington D.C. 1980.

APPENDIX E-2

SCENIC QUALITY RATING CRITERIA

landform

Topography becomes more interesting as it gets steeper or more massive, or more severely or universally sculptured. Outstanding landforms may be monumental, as the Grand Canyon, the Sawtooth Mountain Range in Idaho, the Wrangell Mountain Range in Alaska, or they may be exceedingly artistic and subtle as certain badlands, pinnacles, arches and other extraordinary formations.

vegetation

Give primary consideration to the variety of patterns, forms, and textures created by plant life. Consider short-lived displays when they are known to be recurring or spectacular. Consider also smaller scale vegetational features which add striking and intriguing detail elements to the landscape; e.g., gnarled or windbeaten trees, joshua trees, etc.

water

That ingredient which adds movement or serenity to a scene. The degree to which water dominates the scene is the primary consideration in selecting the rating score.

color

Consider the overall color(s) of the basic components of the landscape (i.e., soil, rock, vegetation, etc.) as they appear during seasons or periods of high use. Key factors to use when in rating "color" are variety, contrast and harmony.

adjacent scenery

Degree to which scenery outside the scenery unit being rated enhances the overall impression of the scenery within the rating unit. The distance which adjacent scenery will influence scenery within the rating unit will normally range from 0-5 miles, depending upon verticality of topography, vegetative cover and other such factors. This factor is generally applied to units which would normally rate very low in score, but the influence of the adjacent unit would enhance the visual quality and raise the score.

scarcity

This factor provides an opportunity to give added importance to one or all of the scenic features that appear to be relatively unique or rare within one physiographic region. There may also be cases where a separate evaluation of each of the key factors does not give a true picture of the overall scenic quality of an area. Often it is a number of not so spectacular elements in the proper combination that produces the most pleasing and memorable scenery - the scarcity factor can be used to recognize this type of area and give it the added emphasis it needs.

cultural modifications

Consider the impact of change on the visual quality of the characteristic landscape. Cultural modifications in the landform/water, vegetation and addition of structures should be considered and may detract from the scenery in the form of a negative intrusion or actually complement or improve the scenery quality of a unit. Be careful not to confuse interest with scenery quality. Rate accordingly.

Source: BLM Manual Section 8411, 1978.

APPENDIX E-3

UTE MOUNTAIN SCENIC QUALITY

A sagebrush-grassland plain comprises the majority of the exchange lands. This is a piedmont alluvial plain forming at the base of the Sangre de Cristo Mountains. The land has a gentle roll in a generally level landform. Arroyos and ephemeral creeks cross the plains. With the exception of Costilla Creek, they form only a minor depression in the landform. Costilla Creek has eroded through the plateau to join the Rio Grande some 120 feet below. The plain is dominated by big sage and broom snakeweed with small percentages of grasses and shrubs. Textures and colors are even with little contrast. Soils are light, shrubs are chalky greens, grasses range from light green to light ochre. Patches of false buckwheat add a localized but strong red to the landscape. Strong value (light to dark), chroma (color), and lineal contrasts are provided by the irrigated farmlands adjoining the exchange lands.

The Rio Grande Gorge is a 120-foot cut snaking its way along the western edge of the exchange lands. Vegetative species are similar to the plains but are interspersed among the basaltic boulders lining the gorge. Some willows and saltcedars grow along the floor of the gorge but regular scouring by the Rio Grande prevents much accumulation. The Rio Grande dominates the gorge. It reflects the steepness of the sides and the intensity of the sky back to the viewer. The dark basaltic rocks contrast sharply with the grey-greens, ochres, yellows, reds, and tans of the vegetation. Seasonal changes add much variety. Once in the gorge, viewing ranges are confined to the gorge. From the plains, particularly from the air or Ute Mountain, the gorge adds a striking lineal element to the landscape. The gorge begins about six miles north of the Colorado state line and gradually deepens to about 1,200 feet deep at Embudo about three miles south of the southern Taos County line. The gorge is natural in character with the only distinct intrusion, an old building and some corrals, north of the state line.

Ute Mountain is one of several extinct volcanoes dotting the plateau between the Sangre de Cristos on the east and the San Juan, Conejos, and Jemez mountains on the west. This conical peak rises to 10,093 feet, some 2,500 feet above the surrounding plain. Conifers are interspersed with aspens and these forest stands are interspersed by montane meadows. This mixture adds value, chroma, and texture contrasts. Water sources are absent from the mountain. Colors range from the light tans and greens of grasses and yellows and whites of aspens, to the dark browns of soils and dark greens of the conifers. Seasonal patterns add further variety. The random natural patterns of the mountain contrast interestingly with the very geometric patterns of the adjacent farmlands. Ute Mountain is one of four mountains of similar visual character in the area: San Antonio Peak, Cerro de la Olla, and Guadalupe Mountain. San Antonio Peak and Ute Mountain, because of their height and the nature of their surroundings, are visual elements in the landscape for a considerable distance: 35 miles to the north and 44 miles to the south. A couple of unimproved roads extend partially up the base of Ute Mountain; they are minor modifications. Also, evidence of logging operations (stumps and tops) dating back some 30 to 50 years may be seen on the northern slopes; this aspect is a negligible modification in the landscape.

Source: PNM 1979.

APPENDIX F

CALCULATION OF GRAZING VALUES

Dollar-value figures for the AUMs of grazing that may be lost as a result of the land exchange are not available. The BLM has set a 1981 grazing fee of $2.30. This would make the 3,049 AUMs lost in the proposed Ute Mountain Exchange worth approximately $7,012 to the BLM. The 1979 average monthly rate per head for pasturing cattle on privately owned land in New Mexico was $6.70. This would make the AUMs lost through the exchange worth $20,428 per year.

The Navajo livestock operators frequently have sheep and/or goats rather than cattle. An estimate of gross AUM value was made using 1979 New Mexico agricultural statistics.

Cash receipts	$14,723,000
Value of home consumption	1,635,000
Value of wool	4,580,000
Gross receipts	$20,938,000

January 1, 1979 sheep and lamb inventory	604,000 head
Sheep death loss	-75,000 head
Net sheep inventory	529,000 head

Using the above figures, the value per AUM was derived as follows.

$$\frac{529{,}000 \text{ head of sheep}}{5 \text{ head sheep/cow}} = 105{,}800 \text{ Animal Units (AUs)}$$

$$105{,}800 \text{ AUs} \times 12 \text{ months} = 1{,}269{,}600 \text{ Animal Unit Months (AUMs)}$$

$$\frac{\$20{,}938{,}000 \text{ gross receipts}}{1{,}269{,}600 \text{ AUMs}} = \$16.49/\text{per AUM}$$

There are some questions about the validity of this kind of estimate because the inventory and death loss figures may be interpreted differently. However, the figures do give an approximation.

glossary

GLOSSARY

ACTIVITY OCCASIONS. One person participating in one recreation activity during 12 or more hours of one day.

ALLOTMENT. An area of land designated and managed for grazing of livestock.

ALLOTMENT MANAGEMENT PLAN (AMP). A documented program which applies to livestock operations on the public lands, which is prepared in consultation with the permittee(s) or lessee(s) involved, and which: (1) prescribes the manner in and extent to which livestock operations will be conducted in order to meet the multiple-use, sustained-yield, economic, and other needs and objectives as determined for the public lands through land use planning; and (2) describes the type, location, ownership, and general specifications for the range improvements to be installed and maintained on the public lands to meet the livestock grazing and other objectives of land management; and (3) contains such other provisions relating to livestock grazing and other objectives as may be prescribed by the authorized officer consistent with applicable law.

ALLUVIUM. Unconsolidated geologic material deposited by water; usually contains and transmits water.

ANIMAL UNIT MONTH (AUM). The amount of forage required to sustain the equivalent of one cow, one horse, two elk, three Barbary sheep, five domestic sheep, five goats, five deer, or ten antelope for one month.

AQUIFER. A rock formation containing water and capable of transmitting it to a well.

AREA OF CRITICAL ENVIRONMENTAL CONCERN (ACEC). An area within the public lands where special management attention is required (when such areas are developed or used, or where no development is required) to protect the area and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources, or other natural systems or processes, or to protect life and safety from natural hazards.

BASALT. A type of rock formed by ancient flows of lava; this rock is usually high in iron and magnesium silicates.

BIOME. The largest, most easily recognizable community occurring on land. It is described by the major form of vegetation present. In a given biome, the form of the vegetation is uniform; e.g., coniferous forest, woodland, grassland. The level of analysis in the Wildlife section is the biome. This level was chosen because the best data source available, which puts the Bisti and Ute Mountain lands on an equal footing, is compiled at the biome level. This information comes from the U.S. Forest Service (1978, 1980). The terminology and numbering system from these two Forest Service sources have been retained to facilitate return to them as needed.

CHANNEL SEEPAGE. The loss of streamflow due to seepage into the channel bottom.

CLASS I, II, III, OR IV AREAS (PALEONTOLOGY). Locations determined to have different importance values according to the type of fossils present and the mitigation of impacts recommended (refer to Appendix B).

DISPERSED RECREATION. Consists of those outdoor recreation activities that occur outside of areas that are intensively managed to facilitate concentrated recreational use. The recreational emphasis in this category is on the environment, with a close correlation between the environmental quality and the quality of the recreational experience. The environment is viewed as important for its own intrinsic values.

ECOSYSTEM MAINTENANCE SPECIES. Those species that make up the bulk of an ecosystem's animal life but which are not included in recovery (listed) or harvest (game/furbearers) categories. They are important because they make a given ecosystem what it is. Because society has not singled them out by law for high-intensity preservation or for sport and commercial harvest, they are not normally recognized individually.

EPHEMERAL STREAM. A stream that flows only in response to a storm event.

FLOODPLAIN. A relatively flat area of stream-laid deposits subject to repeated flooding.

GROUND WATER INFLOW. The movement of water from beneath the ground surface into a stream, thereby increasing streamflow.

GROUP I, GROUP II. State listed animals are placed in either Group I or Group II. New Mexico Group I animals are those whose prospects of survival or recruitment in the state are in jeopardy. Group II animals are those who prospects of survival or recruitment within the state may be in jeopardy in the foreseeable future (NMDGF 1979).

HARVEST SPECIES. A species subject to sport or commercial utilization under regulations of the New Mexico Department of Game and Fish.

HUMATES. Carbonaceous claystones or shales rich in decomposed organic matter. They are usually found in close association with coal deposits and are used as a soil conditioner.

IGNEOUS ROCK. Rock formed by the solidification of a molten material.

IMPORTANCE VALUE (PALEONTOLOGY). The degree of scientific worth and necessity for mitigation of a specific fossil assemblage (refer to Appendix B of this document for a discussion of these classifications).

INFRASTRUCTURE. The basic framework of community social support sub-systems, such as transportation, law enforcement, health care, and waste disposal.

LODE CLAIM. A type of mining claim that is staked on a deposit that is in place in a vein, ledge, zone or belt of mineralized rock lying within boundaries clearly separating it from the surrounding rock.

MANAGEMENT FRAMEWORK PLAN (MFP). BLM's land use plan for public lands that provides a set of goals, objectives, and constraints for a specific planning area to guide the development of detailed plans for the management of each resource.

PERENNIAL STREAM. A stream that flows all year.

RECOVERY SPECIES. A species listed by the federal or state government as endangered or threatened (rare). The intent of such listing is to provide protection and management authorities so that these species may be restored to desired levels and avoid extinction.

RECURRENCE INTERVAL. A statistical term used to express the probability of a given flood flow. For example, a 100-year flood has a one percent chance of occurring in any given year. A five year flood has a 20 percent chance of occurrence each year.

RIPARIAN. Pertaining to, or living on, the bank of a river, a lake, or tidewater. May also include temporary waters, generally refers to vegetation.

SCENIC QUALITY RATING UNIT: A portion of the landscape which displays primarily homogeneous visual characteristics of the basic landscape features (land and water form, vegetation, and structures) that separate it from the surrounding landscape.

SECTION 3 ADMINISTRATION. Applies to public lands within grazing district boundaries that are administered in accordance with Section 3 of the Taylor Grazing Act.

SECTION 15 ADMINISTRATION. Applies to public lands outside grazing district boundaries that are administered in accordance with Section 15 of the Taylor Grazing Act.

SPECIES DIVERSITY. The concept of species diversity, as used for this assessment, is based upon the definition published in Agriculture Handbook No. 553 (Thomas, 1979). For the purpose of this assessment, species diversity is defined as the number of wildlife species known or potentially occurring in an exchange area, either the Bisti Lands or the Ute Mountain Lands. Therefore, the total number and kinds of animals expected in each of the exchange lands is viewed as a relative value under species diversity.

TAXA. The various classification of fossils, plants, or animals in groups according to their presumed natural relationships.

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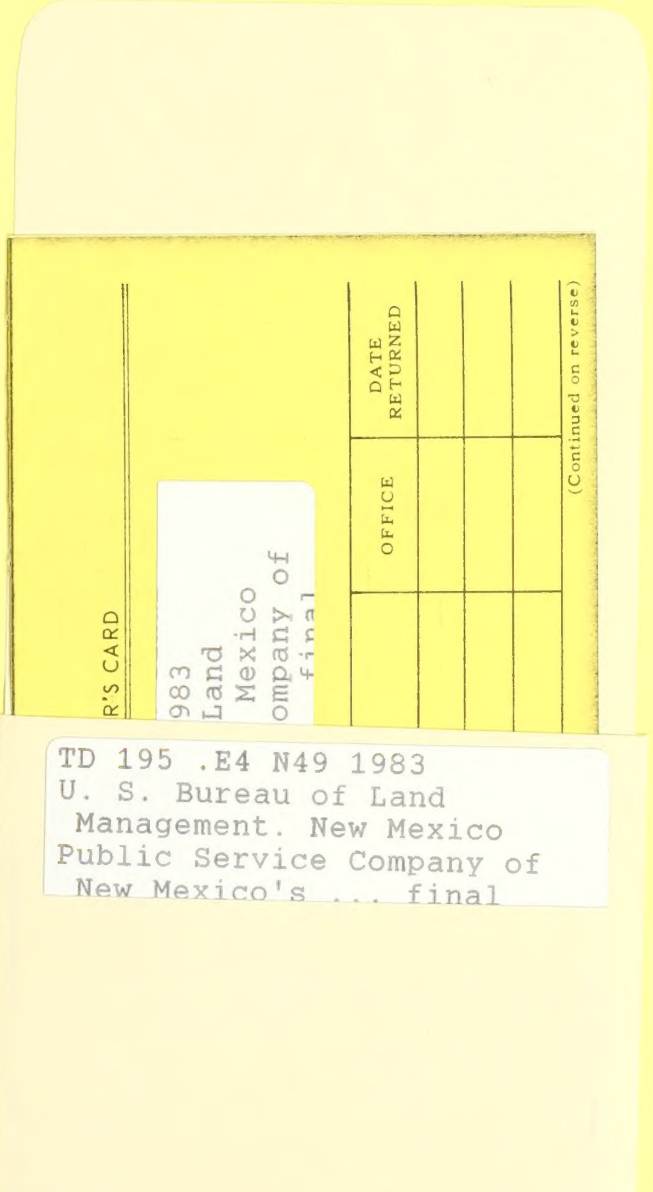

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